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AEROSPACE MEDICINE AND BIOLOGY

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

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Scientific and Technical Information Division

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON, D.C.

MARCH 1965

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INTRODUCTION

Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project (AMBBP) of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics, and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

- a. NASA entries identified by their *STAR* accession numbers (N65-10000 series),
- b. AIAA entries identified by their *IAA* accession numbers (A65-10000 series); and
- c. LC entries identified by a number in the A65-80000 series.

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Articles listed are available in the journals in which they appeared. They may be borrowed or consulted in libraries maintaining sets of these journals. In some instances, reprints may be available from the journal offices.

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Other organizations can purchase copies of the bibliography from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

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AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography

MARCH 1965

STAR ENTRIES

N65-12340# Rochester U., N.Y.
HAZARD TO MAN FROM I-131 IN THE ENVIRONMENT
Richard George Cuddihy 20 Nov. 1964 75 p refs
(Contract W-7401-ENG-49)
(UR-653)

The major factors involved in the transfer of iodine-131 from the environment into the human body, its source, and the methods of minimizing the radiation hazard are discussed. The possible sources include nuclear-weapons tests, nuclear reactors, and reactor-fuel processing plants. These atmospheric releases can be followed, and their deposition can be predicted with proper meteorological information. An experiment was conducted to determine the fractional uptake of the daily ingested dose of iodine by the human thyroid gland, and safe levels of atmospheric contamination were calculated. The amounts of stable iodine to be added to the daily diet of a dairy cow and of a human being to reduce the assimilation of iodine-131 are given. Other protective measures are cited.

D.S.G.

N65-12413*# Northrop Corp., Hawthorne, Calif. Space Labs.
INVESTIGATION OF PEROGNATHUS AS AN EXPERIMENTAL ORGANISM FOR RESEARCH IN SPACE BIOLOGY
Fourth Quarterly Progress Report, 1 Jul.-30 Sep. 1964
J. J. Gambino and R. G. Lindberg [1964] 12 p ref
(Contract NASw-812)
(NASA-CR-59706; NSL-64-29-4) OTS Prices: HC \$1.00/MF \$0.50

Pocket mice underwent massive doses of gamma irradiation to determine whether they are subject to the same CNS death pattern as other mammals. The animals were lowered into a 5000 curie Co⁶⁰ source that emitted a dose rate of 5.2 krad per minute. The total dosage of irradiation was obtained by the addition of the dose received while in the source of radiation plus the transit dose received while in the lowering and raising processes. It was found that the pocket mice are just as susceptible to high-dose irradiation as are the conventional mice. All animals receiving 13.7 and 24.1 krad exhibited ataxia and other behavioral effects immediately following exposure. Their mean survival time was 7 to 8 days.

G.G.

N65-12416*# National Aeronautics and Space Administration.
John F. Kennedy Space Center, Cocoa Beach, Fla.

RADIOLOGICAL SAFETY HANDBOOK

P. V. King 1 Nov. 1964 117 p
(NASA-TM-X-54859; SP-4-41-S) OTS Prices: HC \$4.00/MF \$0.75

This handbook describes the organization, policy, procedures, and safety requirements for a radiological safety program. It is written as a technical supplement to safety regulations and safety plans for users of X-rays and radioactive materials. The handbook specifically defines KSC procedures and requirements for the procurement, transfer, and shipment of radioactive materials, for the handling and disposal of radioactive materials, and for personnel monitoring, doses, and emergency procedures.

D.E.W.

N65-12491# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering

A MODEL OF THE INTRA-AURAL REFLEX

Stephen Barclay Place (M.S. Thesis) Jun. 1964 25 p refs
(GGC/EE/64-15; AD-603955)

The response of the intra-aural reflex to audiofrequency sounds with defined amplitude envelopes was measured and recorded. Based upon these data, as well as upon a block diagram consideration of the linear and nonlinear physiological aspects of the intra-aural reflex, an analog computer circuit was developed to model the reflex. The model was subjected to the same stimulus shapes, and the response was recorded. Comparison of the response of the reflex and the response of the model revealed a high degree of correlation, and validated the choice of building blocks used for the simulation. Author

N65-12528# Virginia Inst. of Marine Science, Gloucester Point.

A MATHEMATICAL ANALYSIS OF THE DYNAMIC SOARING FLIGHT OF THE ALBATROSS WITH ECOLOGICAL INTERPRETATIONS Special Scientific Report No. 50

Clarence D. Cone, Jr., May 1964 108 p refs Sponsored by NSF

Typically observed soaring patterns and other pertinent flight characteristics of the albatross are described. Using these observations as a basis, an idealized soaring cycle in shear layers is constructed for further analysis. The mechanics of each of the four basic phases of a cycle is investigated in detail, and the fundamental equations of motion and energy

interchanges are formulated. The factors in the equations, expressed in terms of the structural and aerodynamic parameters of the albatross, are analyzed in order to find their relative importance and significance in the ecology of the bird. The combination of basic phases of the ideal cycle with various secondary flight phases to obtain almost any desired flight path is demonstrated. Important related facts in the bird's ecology are discussed in relation to the aerodynamic analyses, and land and ocean soarers are compared by ecology and by aerodynamic requirements. The mechanics of dynamic soaring in gusts is also discussed, and the correspondence to shear-layer soaring is pointed out. D.E.W.

N65-12535# Naval Ordnance Test Station, China Lake, Calif. Aviation Ordnance Dept.

VISUAL SEARCH FOR TARGETS: LABORATORY EXPERIMENTS

Ronald A. Erickson Oct. 1964 45 p

(NAVWEPS-8406; NOTS-TP-3328; AD-448468)

In laboratory experiments, visual search performance of 16 male subjects was measured and related to display- and observer-dependent parameters. Several facts emerged. A significant correlation exists between peripheral visual acuity scores and search-time scores for a search task in a static field. This correlation is dependent upon the angle of the visual axis at which acuity is measured and the number of objects in the field being searched. When the field is moving with respect to the subject, search performance decreases when the velocity of the field increases. Comparison of data from the static search experiment with that from the dynamic experiment indicates that this performance degradation is due to a time limitation and not to motion per se. Further, with velocity increase, foveal acuity becomes more important than peripheral acuity in the search task. Search time is proportional to the number of objects in the display, and introduction of a linear cue into the display greatly decreases search time. Author

N65-12608*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

REPORT OF HEALTH HAZARDS SURVEY ON XS-AM-7 RADAR SYSTEM, JUNE 10-11, 1964

Oct. 1964 15 p refs Survey performed by Controls for Radiation, Inc.

(NASA-TM-X-55110; X-600-64-306) OTS Prices: HC \$1.00/ MF \$0.50

A survey was made to determine the rf and X-ray radiation hazards that confront the personnel of an XS-AM-7 radar system. Dosimeter measurements were taken in the calculated near-field region of the installation and around the antenna itself, to determine the power densities present, and a potential radiation hazard was found within the near field of the antenna. It was recommended that the area around the antenna be fenced in, and that the antenna be equipped with an interlock to prevent its operation at an elevation of less than +10°.

G.G.

N65-12626# Joint Publications Research Service, Washington, D.C.

PROTECTION AGAINST RADIATION AND DOSIMETRY

25 Nov. 1964 62 p Transl. into ENGLISH of 3 chapters from the book "Kratkiy Spravochnik po Radiatsionnoy Zashchite i Dozimetrii" Moscow, Atomizdat, 1964 (JPRS-27535; TT-64-51784) OTS: \$3.00

CONTENTS:

1. RADIATION FROM NATURAL SOURCES p 1-35 (See N65-12627 03-04)

2. RADIATION DOSAGES FOR VARIOUS HUMAN ORGANS AND TISSUES p 36-43 (See N65-12628 03-04)

3. CONTENT OF CERTAIN STABLE ELEMENTS WITHIN OBJECTS IN THE ENVIRONMENT AND IN THE HUMAN ORGANISM p 44-58 (See N65-12629 03-04)

N65-12627# Joint Publications Research Service, Washington, D.C.

RADIATION FROM NATURAL SOURCES

In its Protect. Against Radiation and Dosimetry 25 Nov. 1964 p 1-35 (See N65-12626 03-04) OTS: \$3.00

Radiation from natural sources is divided into cosmic radiation and natural environmental radioactivity. Cosmic radiation and tissue dosages from this source are discussed very briefly. Naturally occurring radioactive isotopes are tabulated with their physical and radiological characteristics, and tables are given of alpha, beta, and gamma emitters of the uranium and thorium series. Characteristics of potassium 40, carbon 14, tritium, and radium 226 are discussed. Natural radon 222 and radon 220 in the lower atmospheric layers are reviewed by geographic location and activity. The natural radioactivity in plants and in food products, caused by potassium 40 or by radium, is treated at length, and the radioactivity of the human body and of various organs is given in tables.

D.E.W.

N65-12628# Joint Publications Research Service, Washington, D.C.

RADIATION DOSAGES FOR VARIOUS HUMAN ORGANS AND TISSUES

In its Protect. Against Radiation and Dosimetry 25 Nov. 1964 p 36-43 (See N65-12626 03-04) OTS: \$3.00

General data on the doses of natural radioactive isotopes contained in rock, soil, air, and the human organism are presented in terms of their effects on man. Radiation doses encountered by man in X-ray therapy and X-ray diagnosis are also given. The information is presented as tables. D.E.W.

N65-12629# Joint Publications Research Service, Washington, D.C.

CONTENT OF CERTAIN STABLE ELEMENTS WITHIN OBJECTS IN THE ENVIRONMENT AND IN THE HUMAN ORGANISM

In its Protect. Against Radiation and Dosimetry 25 Nov. 1964 p 44-58 (See N65-12626 03-04) OTS: \$3.00

Tables are given of the chemical compositions and the concentrations of various elements present in the U.S.S.R. in atmospheric precipitation, river waters, soils, various lake

waters, green plants, food products, fruits and vegetables, cereal crops from various regions, wheat, milk, and human organs and tissues. D.E.W.

N65-12641# Flying Personnel Research Committee (Gt. Brit.)
OXYGEN FOR CIVIL AIRCREW FOLLOWING LOSS OF CABIN PRESSURISATION

H. L. Roxburgh Jul. 1963 8 p refs
(FPRC/Memo.205)

An evaluation is presented of the risks associated with the compromises that have arisen or been suggested for aircrew oxygen systems in civil aircraft. Unlike military aviation, complete loss of cabin pressure is not always considered as a foreseeable risk, and aircrew training in decompression techniques and the use of oxygen masks is often lacking. The obvious impossibility of designing a standard oxygen mask to fit all faces leads to a discussion of methods of countering the effects of mask leakage: (1) delivery of a rich oxygen mixture; (2) use of a small positive pressure in the mask; and (3) constant flow of oxygen. It is recommended that a constant flow system be considered for all aircraft where mask fit is not ensured by fitting and training. However, such systems are unsuitable for altitudes above 40000 ft where a fitted mask is essential, and involve some risk above 30000 ft because the mask is not on the face before decompression. M.P.G.

N65-12653# Michigan U., Ann Arbor. Coll. of Literature, Science, and the Arts

RETENTION OF TRACKING SKILLS Final Report

Arthur W. Melton Sep. 1964 40 p refs
(Contract DA-49-007-MD-1020)
(Rept.-02855-1-F; AD-606236)

The concept of the compatibility of display-control coding with "population stereotypes" for such coding is discussed with respect to the concepts of the interference theory of forgetting, as developed in the context of verbal learning and retention. Using an eye-hand pursuit-tracking task, a preliminary experiment was accomplished in which a few human subjects were given large amounts of practice with compatible and incompatible display-control relationships and with short (2- to 3-day) or long (10- to 40-day) intervals between practice days. The results of the study favored a hypothesis of differential forgetting of tasks involving compatible and incompatible display-control relationships, but only when a coherent target motion (repetitive, nonrandom) was involved. P.V.E.

N65-12662# Joint Publications Research Service, Washington, D.C.

THE DYNAMICS OF EMOTIONAL-VOLITIONAL PROCESSES IN ASTRONAUTS DURING PARACHUTE JUMPS
G. F. Khlebnikov and V. I. Lebedev 14 Dec. 1964 18 p refs
Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 5, 1964 p 3-10

(JPRS-27819; TT-64-51930) OTS: \$1.00

Before emplaning and after landing, the heart rate was measured, and the dynamometry of the hands was carried out. The registered changes in hand strength and in heart rate indicated the emotional "tuning" of cosmonauts to the coming parachute jumps. On the first day of parachute jumping the emotional reactions were markedly different from those of well-trained parachutists. But with training of the volitive processes the emotional manifestation at the repeated parachute jumpings became weaker. Author

N65-12731# Innsbruck U. (Austria). Inst. of Experimental Psychology

COLOR DISCRIMINATION WITHOUT CHROMATIC VISION
First Quarterly Technical Status Report, 1 Jul.-30 Sep. 1964
Anton Hajos 1 Oct. 1964 13 p ref
(Contract DA-91-591-EUC-3325)
(Rept.-1)

The division between the adaptation to artificial chromatic distortions and the adaptation to the natural defects of the eye is presented. The possibility of gaining information from such defects is discussed. G.G.

N65-12732# Joint Publications Research Service, Washington, D.C.

STUDIES IN RADIOTELEMETRY IN PHYSIOLOGY AND MEDICINE

30 Nov. 1964 14 p Transl. into ENGLISH of 3 monographs
"Radiotelemetriya v Fiziologii i Meditsine" Sverdlovsk, 1963
p 10-13, 27-30, 40-44
(JPRS-27600; TT-64-51826) OTS: \$1.00

CONTENTS:

1. BIOTELEMETRIC SYSTEMS IN COSMONAUTICS
I. T. Akulinichev, R. M. Bayevskiy, V. G. Denisov, and V. I. Yazdovskiy p 1-4 (See N65-12733 03-04)

2. THE SYSTEM OF PHYSIOLOGICAL MEASUREMENTS ON THE SPACESHIPS VOSTOK 5 AND VOSTOK 6
I. T. Akulinichev, R. M. Bayevskiy, A. Ye. Baykov, K. P. Zazykin, L. G. Maksimov et al p 5-8 (See N65-12734 03-04)

3. TELEMETRIC SYSTEMS WITH SUCCESSIVE TRANSMISSION OF DATA
E. F. Ovchinnikov, I. T. Akulinichev, R. M. Bayevskiy, A. A. Belyayev, and I. S. Shadrintsev p 9-12 (See N65-12735 03-04)

N65-12733# Joint Publications Research Service, Washington, D.C.

BIOTELEMETRIC SYSTEMS IN COSMONAUTICS

I. T. Akulinichev, R. M. Bayevskiy, V. G. Denisov, and V. I. Yazdovskiy *In its* Studies in Radiotelemetry in Physiol. and Med. 30 Nov. 1964 p 1-4 (See N65-12732 03-04) OTS: \$1.00

The biological telemetry sensors of the physiological and hygienic parameters recorded during the space flights of Soviet spaceships and satellites are listed. These measurements were supplemented by television observation, radio communication, and the monitoring of a number of physical parameters, especially the level of cosmic radiation. G.G.

N65-12734# Joint Publications Research Service, Washington, D.C.

THE SYSTEM OF PHYSIOLOGICAL MEASUREMENTS ON THE SPACESHIPS VOSTOK 5 AND VOSTOK 6

I. T. Akulinichev, R. M. Bayevskiy, A. Ye. Baykov, K. P. Zazykin, L. G. Maksimov et al *In its* Studies in Radiotelemetry in Physiol. and Med. 30 Nov. 1964 p 5-8 (See N65-12732 03-04) OTS: \$1.00

Physiological measurements during space flight are obtained to insure the flight safety and to carry out a program of medicobiological investigations in outer space. A block diagram of the physiological measurement system in the two Vostok spaceships is presented. Through the onboard radiotelemetric devices the following physiological parameters were transmitted: electrocardiograms, pneumatograms, electroencephalograms, electro-oculograms, seismocardiograms, and galvanic skin reactions. G.G.

N65-12735# Joint Publications Research Service, Washington, D.C.

TELEMETRIC SYSTEMS WITH SUCCESSIVE TRANSMISSION OF DATA

E. F. Ovchinnikov, I. T. Akulinichev, R. M. Bayevskiy, A. A. Belyayev, and I. S. Shadrinsev. *In Its Studies in Radiotelemetry in Physiol. and Med.* 30 Nov. 1964 p 9-12 (See N65-12732 03-04) OTS: \$1.00

This is a description of a multichannel biotelemetric system for monitoring the pulse rate, the respiration rate, and the mechanical activity of the heart and other motor activities. The system includes sensors and electrodes, amplifying and measuring devices, an electronic commutator, and a transmitter involving a quartz stabilization with a frequency of 200 kc. It is felt that the field of biological telemetry should eventually include a remote-control consecutive program recording. G.G.

N65-12770# Joint Publications Research Service, Washington, D.C.

REACTION TIME OF MAN

Ye. I. Boyko. 16 Dec. 1964 86 p refs Transl. into ENGLISH of the book "Vremya Reaktsii Cheloveka" Moscow, "Meditsina" Publishing House, 1964, p 73-106, 387-399, 400-416, 417-436, 437-438 (JPRS-27879; TT-64-51954) OTS: \$3.00

The first article discusses the fallacy of depicting human response as a simple reflex, i.e., as a one-track direction of the excitatory process from a single direct signal to the organs of action. The interaction of the verbal signal (the so-called second signal) with the direct signal is analyzed by considering different forms of simple and complicated reactions within the framework of Pavlovian doctrine. According to Pavlov, the "reasoned act" resulting from verbal and nonconcrete thinking is regulated by the second signal. The implications of this fact are discussed in relation to measurements of reaction time in man. The second article consists of a review and discussion of literature concerning reaction time as a laboratory indicator in practical psychological and physiological research applications. A tabular summary of neurochronometrical data by function, time, and data source is appended. M.P.G.

N65-12782# California U., Berkeley. Sanitary Engineering Research Lab.

HARVESTING AND PROCESSING SEWAGE-GROWN PLANKTONIC ALGAE

C. G. Golueke, W. J. Oswald, and H. K. Gee. Sep. 1964 61 p refs (SERL-64-8)

Results of an intensive investigation of the economical harvesting of sewage-grown algae indicate that three steps are required: (1) initial concentration; (2) dewatering or secondary concentration; and (3) final drying. Chemical precipitation and centrifugation were found to be most promising for the first step; however, economically, centrifugation is a borderline operation because of power requirements and capitalization costs. Dewatering using a 12-inch solid-bowl centrifuge pre-coated with lime was the most satisfactory, followed by final drying of a thin algae film on a heated drum. Such drying minimizes loss of labile nutrients, improves digestibility, and produces an essentially sterile product. Sand-bed drying in open air is also a satisfactory low-cost method. Several other very effective processes for all three operations are discussed, but these were judged prohibitive in cost. The entire question of the economics of the process resolves itself into whether

or not there will be a durable and lucrative market for sewage-grown algae and upon the value that can be placed on the purified water produced as a byproduct. M.P.G.

N65-12785# Joint Publications Research Service, Washington, D.C.

AUTOMATION PROBLEMS IN BIOPHYSICS

V. I. Krinskiy et al. 10 Dec. 1964 32 p refs Transl. into ENGLISH from *Biofizika* (Moscow), v. 9, no. 4, 1964 p 484-499, 522-523

(JPRS-27785; TT-64-51910) OTS: \$2.00

The following papers are presented: "Asymptotically Optimal Automatic Devices with Exponential Field of Conversion"; "The Problem of the Spinal Regulation of Motor Activity"; "Reactivity Mechanisms of the Waves of a Rhythmic Electroretinogram during the Aftereffect of a Continuous Light"; and "Model of an Electrically Excited Membrane System." D.E.W.

N65-12802*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

MANUAL-CONTROL SIMULATION STUDY OF A NON-LIFTING VEHICLE DURING ORBIT, RETRO-ROCKET FIRING, AND REENTRY INTO THE EARTH'S ATMOSPHERE

Roger M. Davidson, Donald C. Cheatham, and Jack T. Kaylor. Washington, NASA, Sep. 1960 62 p refs

(NASA-TM-X-359) OTS Prices: HC \$3.00/MF \$0.75

(Declassified)

The six-degree-of-freedom equations of motion for a nonlifting reentry vehicle, such as the Mercury capsule, were solved by an analog computer. The pilot was used to close the control loop. A number of variations in instrument display, side-arm controller, and control-torque output variation with controller displacement were made. The conclusions reached as a result of both pilot opinion and data obtained were that a human pilot is capable of controlling the vehicle dynamics during orbital flight, retrorocket firing (including large misalignment torques), and reentry. In general, orbital control was found easy, and reentry control was a little more difficult. Control of the vehicle while firing the retrorockets, with the associated large misalignment torques, was very difficult but possible. Author

N65-12830# California U., Berkeley. Lawrence Radiation Lab.

HEALTH CHEMISTRY PROCEDURES FOR RADIOISOTOPE SAFETY

13 Oct. 1964 102 p

(Contract W-7405-ENG-48)

(UCRL-11700) OTS: \$4.00

Presented are the following topics: "Organization for Radiation Safety at LRL-Berkeley"; "Administration of Contractual Safety Obligations"; "Procedures Governing the Use of Radioactivity"; and "Radiation Incidents." G.G.

N65-12840# Institute for Research, State College, Pa. **BEHAVIORAL BIOPHYSICS**

Allan H. Frey. Apr. 1964 33 p refs

(Contracts Nonr-3303(00); Nonr-4169(00))

(Rept. 64-01; AD-606961)

This paper is an analytical review, primarily of foreign data, with emphasis upon those relevant to the nervous system and behavior. Papers are reviewed in six groups—sensory effects, conditioning, activity, cortical, subcortical, and

morphological effects. The implications of the data are discussed, and several lines of investigation are suggested. Author

N65-12843# Flying Personnel Research Committee (Gt. Brit.)
THE EFFECT OF IMMERSION ON MEAN INTRAPULMONARY PRESSURE

A. S. Jarrett Nov. 1963 14 p refs
 (FPRC/1220)

The pressure-volume relaxation curves for the chest were determined for the vertical and horizontal positions in air and water. The mean intrapulmonary pressure was shown to increase by 19-cm H₂O in the vertical position, and 7-cm H₂O in the supine position in water, both measured relative to the depth of the sternal notch. The concepts of centroid and eupneic point are discussed, and shown to coincide under appropriate conditions. The optimal positioning of a diver's demand regulator is discussed. Author

N65-12870# Joint Publications Research Service, Washington, D.C.

CONFERENCE ON THE INTERNATIONAL YEAR OF THE QUIET SUN

S. V. Vladimirov 27 Nov. 1964 5 p Transl. into ENGLISH from Priroda (Moscow), no. 9, 1964 p 113-114
 (JPRS-27563; TT-64-51811) OTS: \$1.00

A conference devoted to the organization of medico-biological observations during the International Year of the Quiet Sun (1964-1965) was held May 18 and 19, 1964, at the Institute of Therapy, Academy of Medical Sciences U.S.S.R. The following subjects were discussed: planetwide variations in meteorological and other geophysical fields, and their manifestations in the biosphere; the effect of rhythmic and cyclic solar activity on organic terrestrial life; the biological action of electromagnetic fields, both natural and artificial; and the effect of heliogeographic factors on the cardiovascular system, as studied during the period of the International Geophysical and Geodetic Union. Author

N65-12874# Joint Publications Research Service, Washington, D.C.

ELECTROPHYSIOLOGICAL INVESTIGATIONS OF THE NATURE OF STANDING IN MAN

A. A. Oganisyan 15 Dec. 1964 28 p refs Transl. into ENGLISH from the book "Mekhanizmy Kompensatornykh Prispособleniy" Moscow, Acad. of Sci. USSR, 1964 p 50-61
 (JPRS-27841; TT-64-51935) OTS: \$2.00

The natural electromyogram and the integrated activity of the antigravitation muscles of the legs in the position of standing at rest were studied in children, adults, and invalids with legs amputated at the thigh. Among the conclusions drawn from this study are the following: (1) The electrical activity of the quadriceps muscle was minimal or absent in the majority of healthy subjects standing on both legs or on one leg; in the few where electrical activity was observed, the lateral head of the muscle was more active than the rectus femoris. (2) During standing on both legs, the common center of gravity of the body varied little; during standing on one leg, the correction of equilibrium is effected predominantly by the shin muscles. (3) Only acute and significant displacement of the center of gravity evokes activity of the antigravity muscles. (4) Holding heavy objects in the hands did not cause or intensify activity of the antigravity muscles. Results for amputees and polio victims are also presented. M.P.G.

N65-12875# Joint Publications Research Service, Washington, D.C.

A HUMAN IN A SPACESHIP

L. Markelova, D. Dmitriyev, and L. Bernaskoni 16 Dec. 1964 10 p Transl. into ENGLISH from Sov. Litva (Vil'nyus), 4 Nov. 1964 p 3-4

(JPRS-27880; TT-64-51955) OTS: \$1.00

Experience gained from the Voskhod three-man space-flight is incorporated in a popular review of possible solutions to problems of passenger-carrying spaceships. Life-support-system modifications, radiation protection, and biological compatibility are discussed. M.P.G.

N65-12897# Flying Personnel Research Committee (Gt. Brit.)

DESIGN CONSIDERATIONS IN WHOLE BODY PLETHYSMOGRAPHY

A. S. Jarrett and D. Denison Airmin., Jul. 1963 11 p refs
 (FPRC/Memo-204)

The Institute of Aviation Medicine whole body plethysmograph showed paradoxical pressure changes with a subject inside. These were shown to apply to any plethysmograph, but were only apparent in an instrument made of an insulating material. It is concluded that, ideally, a plethysmograph should be constructed of highly conductive material and should be of a shape that allows easy ventilation between experiments. Author

N65-12931# Joint Publications Research Service, Washington, D.C.

MEDICINE IN ORBIT

Mikhail Novikov 16 Dec. 1964 6 p Transl. into ENGLISH from Trud (Moscow), 15 Oct. 1964 p 2
 (JPRS-27-883; TT-64-51957) OTS: \$1.00

This article presents an overall view of the role of the physician in space medicine. His duties start with his participation in the selection of the cosmonauts, followed by observations and supervision of their physical and mental processes during training. He takes part in the planning and building of the spacecraft and in the selection of trajectories, and will be needed as participating member during prolonged space flights. G.G.

N65-12939# Hanford Atomic Products Operation, Richland, Wash. Physics and Instrument Lab.

PROGRESS IN RADIOLOGICAL PHYSICS: A SUMMARY OF HANFORD LABORATORIES ACHIEVEMENTS IN THESE PROGRAMS UNDER GENERAL ELECTRIC, 1947-1964

W. C. Roesch Sep. 1964 87 p refs
 (Contract AT(45-1)-1350)
 (HW-83605) OTS: \$3.00

The fields of study covered are whole-body counting, neutron dosimetry, theoretical dosimetry, radiation calorimetry, gamma-ray dosimetry, beta-ray dosimetry, accident dosimetry, radiation damage in graphite, and gonadal radiation.

R.L.K.

N65-12974# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

RESPIRATORY GAS ANALYSIS WITH A TIME-OF-FLIGHT MASS SPECTROMETER Final Report, Jun. 1961-Jun. 1964

J. B. Graves and P. R. B. Caldwell Sep. 1964 14 p ref
 (AMRL-TR-64-84; AD-608339)

A modified remote-sampling system was devised for the Bendix Model 17-210 time-of-flight mass spectrometer. This was adapted for use in measuring respiratory gases breath by breath. The stability of the mass-spectrometer output shows a variation of $\pm 5\%$. The sensitivity of the system for oxygen is in the range of 0.2% absolute concentration. The accuracy for oxygen is within $\pm 5\%$ Author

N65-12995# General Electric Co., Philadelphia, Pa. Missile and Space Div.

EMERGENCY BREATHING AND SUIT PRESSURIZATION SYSTEM

R. A. Miller and D. J. Withey Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs., Sep. 1964 45 p (Contract AF 33(657)-11345) (AMRL-TR-64-60; AD-608088)

The design and fabrication of an emergency breathing and suit pressurization system (EBSPS), capable of sustaining three full-pressure suited crewmen within the Aerospace Medical Research Laboratories life-support-system evaluator, were investigated. Two operating modes are provided: (1) When the evaluator is pressurized, the emergency breathing and suit pressurization system operates as an open-loop system and ventilated the pressure suit and the ambient air. (2) When the evaluator is depressurized, the emergency breathing and suit pressurization system operates as a closed environmental control system, and provides the crewmen with a habitable atmosphere. In this latter mode, the system regulates the suit pressure, the CO₂ partial pressure, relative humidity, composition (100% O₂), and temperature of the ventilating air, and supplies oxygen for breathing and leakage makeup as required. In all modes, the emergency breathing and suit pressurization system regulates the flow of ventilating atmosphere through the pressure suits. Author

N65-12996# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio. Behavioral Sciences Lab.

THE EMERGING ROLE OF ENGINEERING PSYCHOLOGY Final Report

Julien M. Christensen Sep. 1964 20 p refs (AMRL-TR-64-88; AD-608215)

The history of engineering psychology and its relationship to engineering are briefly traced. The emergence of engineering psychology from the "knobs and dials" stage to a full-fledged participating profession in systems planning and development is described. Some of the problems confronting engineering psychology are described, the chief of which is the development of suitable educational programs in a sufficient number of universities to supply the current and anticipated demand for workers in this area. Author

N65-13111# Naval Medical Research Lab., New London, Conn. **EXERCISE TOLERANCE STUDIES IN AN ARTIFICIAL ATMOSPHERE UNDER INCREASED BAROMETRIC PRESSURE**

John I. Lynch 2 Jan. 1964 22 p refs (Rept.-419; AD-449531)

A study was made to determine the ability of human subjects to do exercise while living under pressure equivalent to

200 feet of sea water and to record the cardiovascular reactions of the subjects of this exercise. In terms of work potential and work tolerance, no decrement in performance was found during a period of 10-days' confinement of three men at 7 atmospheres of pressure. The indication of detrimental effect as noted in the cardiovascular scores in the "step-up" test appears to be due to the problem of carbon dioxide accumulation and the difficulty in reducing its concentration in a closed atmosphere. D.S.G.

N65-13117# Gt. Brit. Dept. of Scientific and Industrial Research. Warren Spring Lab.

HUMAN SCIENCES IN INDUSTRY (ANNOTATED BIBLIOGRAPHY). PART I: ERGONOMICS

Oct. 1964 137 p refs

This is a bibliography of papers pertaining to biotechnology in industry. Among the subjects presented are human factors, psychological concepts, the effects of alcohol, environmental effects, and behavioral observations. G.G.

N65-13172# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

A STUDY OF THE ACOUSTIC REFLEX IN INFANTRYMEN

Michael H. L. Hecker and Karl D. Kryter 1 Oct. 1964 30 p refs

(Contract DA-49-007-MD-985)

(Rept.-1159; AD-449855)

The degree of reflex response to monaurally presented white noise (100 dB SPL) was measured and graphically recorded at the contralateral ear for 40 career infantrymen with an acoustic bridge. These soldiers had been exposed to controlled amounts of weapon noise, and preexposure and post-exposure audiograms were obtained. The results show that subjects with a high-preexposure HL are less susceptible to TTS than subjects with normal hearing. The results further indicate that a strong acoustic reflex is associated with high rather than low preexposure HL for subjects having no appreciable conductive hearing impairment. Subjects with suspected middle-ear disorders exhibited no reflex response to the same stimulus. Author

N65-13205# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

TRANSMISSION AND CODING OF INFORMATION IN AUDITORY NERVOUS SYSTEM Final Report, 8 Jan. 1962-14 Feb. 1964

W. D. Neff [1964] 55 p refs /ts Rept.-1127

(Contract AF 49(638)-1142)

(AFOSR-64-0966; AD-600222) OTS: \$5.60

Summarized are studies made of the changes that occur in neural activity during learning and during different stages of alertness and sleep. Responses evoked from the auditory system of cats during conditioning to an acoustic signal have been measured by means of electrodes implanted in the inferior colliculi and on the auditory cortex. It is concluded that the changes observed in the evoked response are not to be taken as neural correlates of learning. Results of studies of "EEG Responses to Auditory Stimuli During Sleep," "Cortical Responses after Transection of the Brachium of the Inferior Colliculus and Adjacent Pathways," and "Evoked Potentials in Neocortex of Unanesthetized Opossum" are presented in three appendixes. P.V.E.

N65-13216# Virginia U., Charlottesville.

A SURVEY OF CHRONIC WEIGHTLESSNESS SIMULATION IN BIOLOGICAL RESEARCH

[1964] 114 p refs

(Contract AF 18(600)-2057)

(HQARSC-TDR-64-1; AD-607052) OTS: \$2.75

The experimental simulation of weightlessness by prolonged, quiet bed rest, by water flotation, and by body and/or limb immobilization is evaluated. The value of the simulation of a low-gravity environment by immobilization was found questionable because it produces the type of low activity characterized by reduced external motion, whereas a true weightlessness environment would not necessarily prevent external motion and might even permit greater amounts of such motions. It was found that studies of immobilization can be related to the restrictions that are imposed by the size of the existing space capsules, but should not be used to predict the effect of true weightlessness.

G.G.

N65-13333# Dow Chemical Co., Denver, Colo. Rocky Flats Div.

A STUDY OF TWO COMMERCIAL FILM BADGE SERVICES

J. R. Mann 21 Dec. 1964 12 p

(Contract AT(29-1)-1106)

(RFP-451) OTS: \$0.50

The services of two commercial film-badge processors were purchased for a 3-month trial period. Fifty badges from each company were exchanged every two weeks. Each badge contained a beta-gamma and a nuclear track film. Each supplier stamped the date and a code number on each film wrapper. The user was required to change the film in the badges every two weeks and ship the used film back to the supplier for processing and evaluation. Results were then received an average of 18.5 days after the film was returned. The average of the dose results for beta-gamma radiation for Company A was 2.7 times higher than the Dow badge, while for Company B the average was 0.77 of the dose measured with the Dow badge. Both companies were lower than Dow on average neutron dose—Company A by a factor of 2, Company B by a factor of 40.

Author

N65-13393# Bureau of Mines, Pittsburgh, Pa.

METHANE-OXIDIZING BACTERIA A Review of the Literature

Melvin P. Silverman 1964 42 p refs

(BM-IC-8246)

The literature reviewed concerns the growth and isolation of cultures by special techniques; the distribution of these organisms in nature and the descriptions of individual species; the physiology of methane-oxidizing bacteria as influenced by temperature, light, pH, aerobiosis versus anaerobiosis, and carbon and nitrogen sources; and the biochemistry of methane oxidation revealed by studies with intact cells and subcellular systems.

Author

N65-13398# Joint Publications Research Service, Washington, D.C.

OUTLINES ON THE STRUCTURE AND FUNCTION OF THE BRAIN

S. A. Sarkisov 22 Dec. 1964 140 p refs Transl. into ENGLISH from the book "Ocherki po Strukture i Funktsii Mozga" Moscow, 1964 p 5-7, 9-17, 117-148, 173-209, 231-261 (JPRS-27947; TT-64-51986) OTS: \$4.00

A discussion of the general problems on the structure and function of the human nervous system with consideration of research on the fine mechanisms of brain activity is presented. Special significance is given to the neuron and interneural

connections in normal and pathological states. Electroencephalographic investigations to determine morphological structures and functions of individual regions of the brain are reported.

E.C.

N65-13417# Joint Publications Research Service, Washington, D.C.

SOVIET ENVIRONMENTAL PHYSIOLOGY AND TOXICOLOGY (A SURVEY OF THE PUBLISHED LITERATURE, 1958-1964)

10 Dec. 1964 110 p refs

(JPRS-27767; TT-64-51901) OTS: \$4.00

A survey of Soviet literature in physiology and toxicology is presented with differing opinions in regard to effectiveness of vaccination methods and specificity of certain tests for communicable diseases. Also, the following areas of space medicine are discussed: *Respiration, Artificial Atmospheres, Conditioning Techniques, Acceleration, Weightlessness, and An On-Board "Electronic Doctor"*. The areas discussed in submarine medicine are: *Fatigue; Communicable Diseases; Cold, Heat and Nonspecific Resistance of the Organism; and Radioactivity and Air Contaminants*. A bibliography is included.

E.C.

N65-13509# Joint Publications Research Service, Washington, D.C.

PHILOSOPHICAL PROBLEMS IN SCIENCE

G. M. Dobrov et al 29 Dec. 1964 47 p refs Transl. into ENGLISH of 3 articles from *Vopr. Filosofii* (Moscow), no. 10, Oct. 1964 p 59-82, 151-157

(JPRS-28029; TT-65-30010) OTS: \$2.00

On the Prognoses for the Development of Science, discusses the character of scientific development, the possibility of limits and scientific productiveness. *Modern Questions in the Organization and Localization of Brain Functions* deals with the organization of the brain function, the organization of the cortico-subcortical interaction, methods for studying the localization of brain functions, methods of representing the localization of brain functions, and the localization of higher psychic functions. A review is given of the book. *Totality and Development in Light of Cybernetics*.

R.L.K.

N65-13512# Human Factors Research, Inc., Los Angeles, Calif.
A STUDY OF FACTORS INFLUENCING THE JUDGMENT OF HUMAN PERFORMANCE. IRRELEVANT FACTORS IN THE JUDGMENT OF HUMAN PERFORMANCE

Frank L. Herbert, H. D. Kimmel, and James J. Mc Grath Sep 1964 21 p refs

(Contract Nonr-4140(00))

(TR-4; AD-607079) OTS: \$1.00

The effect of the order of judging the performance of different individuals on the judgments themselves was studied. The performance tasks are described, and the observation conditions for the people judging the performance are given. Results showed that, even when performances were objectively equated and the order of their being judged was controlled by complete counterbalancing, significant differences were present among the average ratings given to the three operators. There was no difference in the average ratings due to ordinal position in which the operator was judged. The most important implication of these results is considered to be that subjects tend to judge performances as different even when they do not differ objectively and even when other factors, such as the order in which they are judged, are controlled. The possibility is considered that the judges' task in this situation induced a set of "find" differences when there were none.

D.E.W.

N65-13532# Ohio State U. Research Foundation, Columbus.
**RESEARCH ON THE PRODUCTION OF CLINICAL RADIO-
 GRAPHS BY MEANS OF COMPACT, LOW-ENERGY AND
 HIGH-INTENSITY RADIOACTIVE SOURCES** Final Report,
 15 Apr. 1958-30 Sep. 1964

H. D. Spangenberg and M. L. Pool Sep. 1964 20 p refs
 (Contract Nonr-495(17))
 (Rept.-5; AD-607174)

Of approximately 1300 currently known radioactive nuclides, only 48 appeared worthy of detailed study. Only 11 of these met the criteria essential for eventual clinical usefulness. The criteria chosen were that the radioactive nuclides be readily available, be capable of easy production, have a half-life of one month or more, possess a suitable emission spectrum, and be capable of providing a high specific activity source. Some of the important properties of the 48 radioactive nuclides, used in their evaluation in accordance with the five criteria, are tabulated. Although no one nuclide holds first position in each of the above five criteria nevertheless ^{125}I , ^{131}Cs , ^{144}Ce , ^{145}Sm , ^{153}Gd , ^{155}Eu , ^{159}Dy , ^{169}Yb , ^{170}Tm , ^{175}Hf , and ^{181}W reasonably satisfy the requirements for isotopic radiography. Author

N65-13546# General Technical Services, Inc., Cleveland, Ohio.

**ANALYSIS OF THE DYNAMIC SYSTEMS RESPONSE OF
 SOME INTERNAL HUMAN SYSTEMS**

A. S. Iberall and S. Z. Cardon Washington, NASA, Jan. 1965
 115 p refs

(Contract NASw-1066)

(NASA-CR-141) OTS HC \$4.00/MF \$1.00

This document summarizes the first round of theoretical and experimental work undertaken on specific internal biologic systems. It discusses the thermoregulation system, the cardiovascular system, the hormonal system, and the behavioral system. Author

N65-13626# National Aeronautics and Space Administration, Washington, D C

AVIATION AND SPACE MEDICINE

V. V. Parin, ed. Dec. 1964 464 p refs Transl into ENGLISH of the book "Aviatsionnaya i Kosmicheskaya Meditsina" Moscow, Akad Med Nauk SSSR, 1963

(NASA-TT-F-228) OTS HC \$7.63/MF \$2.25

For titles of individual papers see N65-13627 through N65-13781, Issue No. 4, Categories 04 and 05

N65-13627# National Aeronautics and Space Administration, Washington, D.C.

**RESULTS OF PHYSIOLOGICAL INVESTIGATIONS ON
 THE SPACESHIPS VOSTOK 3 AND VOSTOK 4**

I. T. Akulinichev, R. M. Bayevskiy, V. Ye. Belay, P. V. Vasil'yev, O. G. Gizenko et al. *In its Aviation and Space Med.* Dec. 1964 p 3-5 (See N65-13626 04-04) OTS HC \$7.63/MF \$2.25

According to EEG data, during the first few hours of exposure to weightlessness there was a predominance of rhythms with a frequency of 5 to 7 oscillations per second and a comparatively high amplitude. Later there was a gradual shift toward high frequency oscillations (β rhythm) with a decrease in average amplitude. The daily periodicity of electric resistance of the skin remained unimpaired throughout the flight. According to electro-oculogram data, asymmetry of oculomotor reactions, which might indicate impairment of the vestibular centers, and nystagmus were not detected in either astronaut. The changes in oculomotor activity in both astronauts were phasic in character. Eye movements were sweeping and frequently uncoordinated. No cardiac or respiratory abnormalities were observed. The mental activity and

neuroregulatory capabilities of the astronauts remained on a high level. P.V.E.

N65-13628* National Aeronautics and Space Administration, Washington, D.C.

**CHANGES IN SOME INDICES OF RESPIRATORY BIO-
 MECHANICS IN SICK AND HEALTHY PERSONS UNDER
 THE CONDITIONS OF HYPOXIA**

V. N. Alifanov *In its Aviation and Space Med.* Dec. 1964 p 5-9 (See N65-13626 04-04) OTS HC \$7.63/MF \$2.25

Presented are data on changes in maximum pulmonary ventilation (MPV) and respiratory reserve, volumetric flow rate of air during forced inhalation and exhalation (pneumotachometry), forced vital capacity of the lungs (FVCL), and forced vital capacity during the first second of exhalation (Tiffno's index). These data were obtained while the subjects were in a pressure chamber at a simulated altitude of 5000 m and again while they were breathing mixtures of gases containing 11% oxygen under normal atmospheric pressure. The subjects were 30- to 40-year old pilots, both healthy men and those with incipient signs of cardiovascular disease or residual symptoms of respiratory disease. The subjects exhibited a significant increase in the MPV averaging 20% to 28% in the simulated altitude studies, but no significant changes in the MPV were noted on breathing the hypoxic mixture. The FVCL did not change significantly during either investigation. Tiffno's index in rarefied air had a distinct tendency to be low in the healthy persons and in those with residual symptoms of lung pathology. The space velocity of forced inhalation did not change significantly in subjects breathing the hypoxic mixture, but increased in all subjects at the simulated 5000-m altitude. P.V.E.

N65-13629* National Aeronautics and Space Administration, Washington, D.C.

**CHANGES IN BIOELECTRIC ACTIVITY OF THE MYOCARDIUM IN MAN AFTER EXPOSURE TO HYPOXIC HYPOXIA
 ACCORDING TO THE DATA OF VECTOR ANALYSIS**

V. N. Alifanov and L. M. Zemesheva *In its Aviation and Space Med.* Dec. 1964 p 9-11 (See N65-13626 04-04) OTS HC \$7.63/MF \$2.25

Investigations were conducted in a pressure chamber where the subjects remained for 30 minutes at an "altitude" of 5000 m. EKG's, taken before the "climb" and after 20 min. at the altitude, were recorded in standard, amplified, and unipolar thoracic leads, which made frontal vector measurement possible, and in Aricci's leads, which permitted vector analysis of the EKG to be made in a sagittal plane. Pilots 35 to 45 years old with good tolerance of hypoxia (15 healthy persons and 15 persons with incipient atherosclerotic cardiovascular disease) were examined. Neither the direction nor the magnitude of the sagittal vectors changed reliably under the conditions of hypoxia. In the healthy persons, the most characteristic changes occurred in connection with frontal vector measurements. The frontal vector measurement in persons with cardiosclerosis had its own peculiarities, which were indicative of some oxygen deficit of the myocardium. P.V.E.

N65-13630* National Aeronautics and Space Administration, Washington, D.C.

BIOTELEMETRY ON MANNED SPACE FLIGHTS

G. V. Altukhov *In its Aviation and Space Med.* Dec. 1964 p 12-14 (See N65-13626 04-04) OTS HC \$7.63/MF \$2.25

A general discussion of the problems involved in medical monitoring of manned space flights is presented. Unlike laboratory equipment, the instruments on a spaceship must be very small and light, and operate efficiently and reliably

when exposed to overloads and other flight factors. Some methods used in the flights of Gagarin, Nikolayev, and Popovich are outlined in general. The application of computers to the interpretation and mathematical processing of the telemetry data is also discussed. P.V.E.

N65-13631* National Aeronautics and Space Administration, Washington, D.C.

SOME PROBLEMS IN THE PSYCHOLOGY OF FLIGHT ACTIVITIES

B. S. Alyakrinskiy *In its Aviation and Space Med.* Dec. 1964 p 14-17 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The problems of training young pilots, particularly to read and interpret instruments, are discussed. The idea of informograms is presented. An objective informogram is a characterization of the optimum cross section of pilot activity during a given portion of flight. A subjective informogram would result from solving one actual problem encountered by a pilot. A comparison of objective and subjective informograms makes it possible to analyze in detail specific flight conditions, and to judge the relationships among the demands made on man by flight activities, particularly those requiring the functioning of his visual analyzer. In devising individual training programs, it would be possible to have a characteristically individual informogram, which, when compared with the subjective informogram, would enable an instructor to predict the difficulties involved in learning and relearning the science of aerial navigation. P.V.E.

N65-13632* National Aeronautics and Space Administration, Washington, D.C.

SOME PROBLEMS IN ENSURING THE RADIATION SAFETY OF SPACE FLIGHTS

V. V. Antipov, V. G. Vysotskiy, B. I. Davydov, N. N. Dobrov, V. S. Morozov et al *In its Aviation and Space Med.* Dec. 1964 p 18-20 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

It is essential to know the specific role played by cosmic radiation in the overall effect of the various flight factors on the human organism, and, conversely, to know the influence of the nonradiation flight factors on the qualitative and quantitative aspects of the biological effect of radiation. Experiments have indicated that acceleration and vibration will variously affect the development of radiation lesions depending on when and in what order these factors are applied. For long space flights, the question arises as to whether certain doses of cosmic radiation can induce hereditary changes in plants and animals that might severely disrupt the balance existing in a closed ecological system existing on a spacecraft. These and other problems must be solved to assure the radiation safety of space flights. P.V.E.

N65-13633* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF DIFFERENT PARTIAL PRESSURE OF OXYGEN AND ENVIRONMENTAL TEMPERATURE ON REGULATION OF TEMPERATURE RELATIONS IN THE ORGANISM

I. I. Antonov *In its Aviation and Space Med.* Dec. 1964 p 20-24 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The extent to which environmental temperature affects the balancing of heat exchange between the environment and organism exposed to different partial pressures of oxygen was investigated. Conclusions drawn from the data presented include: (1) A change in the partial pressure of O₂ in the atmosphere significantly influences the thermoregulatory function of the body. Progressive hypothermia arises and impairs the normal temperature relations among the various organs and tissues.

(2) The environmental temperature is an important factor in maintaining the thermoregulation at a suitable level in hypoxemia and hyperoxemia. (3) Adaptation in general and thermoregulation in particular of animals to different partial pressure of O₂ are effected by the cerebral cortex. (4) The mechanisms responsible for the development and course of temperature impairment in organisms experiencing either an oxygen insufficiency or the toxic effects of oxygen are similar. P.V.E.

N65-13634* National Aeronautics and Space Administration, Washington, D.C.

MEDICAL SERVICE FOR THE CIVIL AIR FLEET OF THE USSR

A. S. Asribekov *In its Aviation and Space Med.* Dec. 1964 p 24-26 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The development and activities of the medical branch of the Civil Air Fleet (CAF) are discussed. The medical branch is concerned with the medical care and physical well-being of aircraft crews and passengers. The major problems and subjects for future research are outlined. P.V.E.

N65-13635* National Aeronautics and Space Administration, Washington, D.C.

LABOR HYGIENE IN THE SPRAYING OF CHEMICALS FROM CIVILIAN AIRPLANES

T. A. Asribekova *In its Aviation and Space Med.* Dec. 1964 p 26-28 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Various investigations into industrial hygiene with respect to the use of insectofungicides sprayed from aircraft are outlined. The investigations began in 1925 when chemicals sprayed from aircraft were used to control locusts. Current investigations include the study of the effects of the chemicals on humans, the development of protective equipment, handling problems, and evaluation of prophylactic and therapeutic treatment for anyone affected by sprayed chemicals. P.V.E.

N65-13636* National Aeronautics and Space Administration, Washington, D.C.

PHARMACOLOGICAL PROPHYLAXIS AND THERAPY OF AIRSICKNESS

Z. A. Astakhova, Ye. P. Belogortseva, M. D. Kruglik, and P. I. Syabro *In its Aviation and Space Med.* Dec. 1964 p 28-32 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Studies were made on passengers for whom drugs had been prescribed to prevent and to treat airsickness. Combinations of preparations used were (1) Platybrin—a double tartrate of platyphylline (5 g) with caffeine, sodium benzoate, and sodium bromide (15 g each); (2) Platybrin No. 2—Platybrin with 0.1 g of pure caffeine instead of 15 g of caffeine and 15 g of sodium benzoate, and 0.15 g of potassium bromide instead of sodium bromide; (3) PPKB—Platybrin No. 2 with 0.3 g of papaverine hydrochloride; (4) FPPKB—PPKB plus 5 mg of amphetamine; and (5) Platkof—5 mg of platyphylline bitartrate and 150 mg of caffeine and sodium benzoate. The drugs arranged in order of effectiveness are Platybrin and Platybrin 2; PPKB; and FPPKB. These drugs are recommended for prevention and treatment of airsickness. P.V.E.

N65-13637* National Aeronautics and Space Administration, Washington, D.C.

THE DOG SPLEEN RESPONSE TO LATERAL ACCELERATION

Yu. I. Afanas'yev *In its Aviation and Space Med.* Dec. 1964 p 32-35 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Reactive changes in the spleen of dogs subjected to accelerations were investigated. Two experiments were performed

on 28 dogs subjected to a single lateral, chest-back acceleration of 8 g for 3 min, and to 12 g for 1 min. The animals were immunized against plague 2 weeks before the experiment. Conclusions drawn from the experimental results include: (1) Accelerations (both 8 and 12 g) produce degenerative changes in the endothelium of the blood vessels, smooth-muscle cells of the trabeculae and capsule of the spleen, and rupture of vascular walls, causing thrombogenesis therein. (2) Lymph nodes are emptied the first day after acceleration and proliferation of lymphoblasts is inhibited. (3) The histological structure of the spleen returns to normal 2 months after exposure to accelerations. P.V.E.

N65-13638* National Aeronautics and Space Administration, Washington, D.C.

THE EFFICIENCY OF MAN EXPOSED TO RADIAL ACCELERATION AND BREATHING OF OXYGEN AT AN EXCESS PRESSURE

V. I. Babushkin and V. V. Usachev *In its Aviation and Space Med. Dec. 1964 p 36-38 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25*

The effect of radial acceleration on humans breathing oxygen under pressure was studied. The investigations were conducted both in a centrifuge and under flight conditions. It was found that an altitude-compensating suit (ACS) increases tolerances to accelerations by a factor of 0.5 to 1 g. With acceleration and normal pressure breathing of oxygen, the cardiac rate increased by 26 to 60 beats per minute over the initial values. With breathing of oxygen under pressure (350 mm H₂O), the increased cardiac rate was lowered by 16 to 42 beats. When breathing oxygen under pressure but without acceleration, exhalation lasted 2.2 to 4 sec. and inhalation 1.2 to 1.9 sec. During an acceleration of 4 g, exhalation varied in duration from 1.6 to 3.2 sec and inhalation 1 to 1.8 sec. Under conditions of accelerations and breathing at excess pressure (and with the use of an ACS) the subjects experienced considerable difficulty in doing routine work. P.V.E.

N65-13639* National Aeronautics and Space Administration, Washington, D.C.

PHYSIOLOGICAL REACTIONS TO RADIAL ACCELERATION

V. I. Babushkin, P. K. Isakov, V. B. Malkin, and V. V. Usachev *In its Aviation and Space Med. Dec. 1964 p 38-41 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25*

Presented is a partial summary of experiments performed to investigate the effects of radial acceleration on the physiological functions and fitness of fliers. The investigations involved centrifuge as well as actual curvilinear flight tests. Areas of investigation included: (1) reasons for individual resistance to accelerations; (2) the role of the conditioned-reflex component in the mechanism of development of compensatory reactions to excess accelerations; (3) studies of the bioelectrical activity of muscles of the chest, abdomen, and lower extremities in response to accelerations of different intensities; (4) the effects of wearing a g-suit; and (5) gas exchange in the body following exposure to accelerations. P.V.E.

N65-13640* National Aeronautics and Space Administration, Washington, D.C.

TRANSMISSION OF MEDICAL INFORMATION OVER LIMITED-CAPACITY TELEMETRY CHANNELS

R. M. Bayevskiy *In its Aviation and Space Med. Dec. 1964 p 41-43 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25*

The problem of transmitting medical information from a spacecraft to earth is discussed. The ideas of information theory

are examined and methods of reducing the number of messages to be transmitted from a spacecraft are discussed. In particular, the construction of a symbolic code for medical monitoring on space flights is considered. P.V.E.

N65-13641* National Aeronautics and Space Administration, Washington, D.C.

DYNAMICS OF THE ELIMINATION OF CORTICOSTEROIDS AFTER VARIOUS ACTIONS

I. S. Balakhovskiy and I. G. Dlusskaya *In its Aviation and Space Med. Dec. 1964 p 44-45 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25*

The dynamics of the endocrine reactions of rats to sound stimulation and physical exertion (swimming) was studied along with the functional state of the adrenal cortex in fliers and other subjects under conditions characteristic of modern flying. Increased adrenocortical activity was found in all cases. The hormonal reaction in rats to sound or physical exertion was pronounced (an increase of more than 150%); it continued throughout the action (15 to 30 min) and for about 1.5 hours after the activity was halted. Data obtained in pressure-chamber tests showed that human subjects were in a "prestart" state characterized by increased urinary excretion of adrenocortical hormones before the test. Examination of flying personnel completing short flights under different conditions showed that, during flights marked by unusual difficulties, more corticosteroids were excreted than during ordinary flights (increases of 300% to 400% and 40% to 80%, respectively). P.V.E.

N65-13642* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF ACCELERATIONS ON THE GROWTH OF LIVING BEINGS

V. I. Baranov, A. A. Gyurdzhian, M. A. Lomova, L. A. Radkevich, L. T. Tutochkina et al *In its Aviation and Space Med. Dec. 1964 p 46-49 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25*

A special rotating device was used to raise animals under conditions involving prolonged exposure to acceleration. The experiments were performed on white laboratory rats exposed from birth to 4 to 6 hours of rotation daily. The intensity of centripetal acceleration was 1.5 to 3 g. The experimental and control groups were made up of rats from two litters born at approximately the same time. While being rotated the animals were able to move and take food. No differences were noted between the two sets of animals in tolerance to lethal accelerations. The general condition of the experimental rats did not differ from that of the control. However, experimental rats lagged considerably in weight, achieving only 60% to 80% of the control between the 20th and 50th days, and excreted appreciably less. Experimental females exhibited marked impairment of the estrus cycle. P.V.E.

N65-13643* National Aeronautics and Space Administration, Washington, D.C.

LEADING TRENDS IN AVIATION AND SPACE OPHTHALMOLOGY

V. V. Baranovskiy *In its Aviation and Space Med. Dec. 1964 p 49-51 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25*

Directions in which experimentation and investigations in aviation and space medicine should proceed are outlined. Areas mentioned include: (1) determination of the maximum functional capabilities of the eye in connection with the physical and dynamic factors involved in flying; (2) study of the effects of prolonged exposure to rarefied atmospheres, of breathing

at excess pressures, and of acceleration and weightlessness; (3) creation of comfortable seeing conditions in aircraft cabins; (4) determination of the basic laws of visual orientation; and (5) determination of the capacity of the visual analyzer, the maximum amount of information that can be processed in a unit of time, and the degree of change in the volume of information that can be processed while other analyzers are functioning. P.V.E.

N65-13644* National Aeronautics and Space Administration, Washington, D.C.

THRESHOLD CONTRASTS AND BRIGHTNESS TO ENSURE VISIBILITY OF OBJECTS AT NIGHT AND DURING THE DAY

V. V. Baranovskiy, L. N. Meyer, and V. V. Preobrazhenskii *In its Aviation and Space Med.* Dec. 1964 p 51-53 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Laboratory and field investigations of threshold contrasts and brightness in relation to the time of presentation of objects under nighttime and daytime conditions are discussed. Seventy observers with a visual acuity of at least 1 took part in the investigations. Each observer, after a short training period, determined the visibility of objects as they appeared and disappeared in the visual field. The data show that the threshold brightness required to discriminate the silhouette of an object grows with increasing brightness of the background. The smaller the angular dimension of the object, the greater the brightness that is required to discriminate it. The threshold brightness for the appearance of an object is 1.5 to 2 times higher than the threshold brightness when it becomes invisible. It was found that virtually instantaneous discrimination of objects at night could be achieved by doubling the threshold brightness established in the case of an unlimited time of observation. P.V.E.

N65-13645* National Aeronautics and Space Administration, Washington, D.C.

A NEW METHOD OF STUDYING THE TENDENCY TO ILLUSIONS OF SPATIAL ORIENTATION

V. V. Baranovskiy and I. D. Semikopnyy *In its Aviation and Space Med.* Dec. 1964 p 53-56 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In order to assess the effect of visual-kinesthetic stimuli on the excitability of the vestibular apparatus, i.e., on the functional asymmetry of the labyrinth, the degree to which subjects would turn when walking with eyes closed before and after observing moving objects was determined. Before visual-kinesthetic stimulation, 90% of the subjects turned their trunk about 360° while 1 subject (out of 108) turned more than 720°. After visual-kinesthetic stimulation, 72% made turns of about 360°, while 10% of the persons turned more than 720°. In most of the subjects (85 out of 108), the turn after observation of the moving objects was in the direction opposite to that of the movement. It is concluded that the method makes it possible to detect about 96% of persons who develop functional asymmetry of the labyrinth, which results in a misconception of the spatial orientation. P.V.E.

N65-13646* National Aeronautics and Space Administration, Washington, D.C.

INCREASING RESISTANCE AS A MEANS OF PROVIDING BIOLOGICAL PROTECTION AGAINST VARIOUS ENVIRONMENTAL FACTORS DURING FLIGHT

Z. I. Barashova *In its Aviation and Space Med.* Dec. 1964 p 56-59 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A general discussion is presented of the need for developing methods of increasing the resistance of the human body

to the adverse factors that are encountered in high-altitude flights and in space travel. Some observations of the way in which the body reacts to particular factors are mentioned, and the possibility of developing an increased nonspecific resistance as a result of complex conditioning is discussed. P.V.E.

N65-13647* National Aeronautics and Space Administration, Washington, D.C.

RESPIRATION AND GAS EXCHANGE IN AN ACUTE HYPOXIC TEST

A. V. Beregovkin, P. V. Buyanov, and V. B. Malkin *In its Aviation and Space Med.* Dec. 1964 p 59-62 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

An attempt was made to determine the general principles underlying changes in respiration and to detect individual respiratory reactions to hypoxia. Acute hypoxic hypoxia was caused by inhalation of gaseous mixtures of nitrogen with oxygen (9.3% to 10.9% and 8% to 8.5%). Forty-eight essentially healthy males ranging in age from 20 to 23 years were investigated. The principal indices of respiration and gas exchange were determined at rest, during breathing of the gaseous mixture, and after changing to breathing of atmospheric air. From the results obtained it is concluded that the diagnostic criteria of low resistance to oxygen deficiency were the absence of an appreciable change in the volume of pulmonary ventilation or a sharp increase therein (over 100%), a decrease in the depth of respiration, a marked decrease in vital capacity (40% or more), and a marked reduction of gas exchange early in the test followed by a slow return to normal. P.V.E.

N65-13648* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF CHANGE IN THE GAS MEDIUM ON "PRIMARY POTENTIALS" OF THE AUDITORY AREA OF THE CEREBRAL CORTEX IN ANIMALS AND ON SOME FUNCTIONS OF THE ACOUSTIC ANALYZER IN MAN

E. V. Bondarev *In its Aviation and Space Med.* Dec. 1964 p 62-64 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The effect of flight factors on the acoustic analyzer was studied by determining (1) the influence of hypoxia and substitution of helium for nitrogen in the ambient atmosphere on the "primary potentials" of the auditory area of the cerebral cortex in response to sound, and (2) the influence of moderate hypoxia on some functions of the human acoustic analyzer. The results of the investigation indicate the following: (1) Changes in the "primary potentials" of the auditory area of the cat cortex begin to appear at an "altitude" of 5000 m and become more pronounced at 8000 to 9000 m. (2) With hypoxia, there is a lengthening of the latent period of the "primary potentials", a progressive decrease in the amplitude of the negative phase, and an increase in and shortening of the positive phase. (3) Moderate hypoxia at an "altitude" of 5000 m raises the threshold of perception of sound in healthy subjects but somewhat reduces the intelligibility of words at low sound intensities. P.V.E.

N65-13649* National Aeronautics and Space Administration, Washington, D.C.

THE POSSIBILITY OF BIOLOGICAL OBJECTS GROWING AND LIVING A LONG TIME IN A HELIUM-OXYGEN ATMOSPHERE

V. V. Boriskin, P. A. Gul'tyayev, and B. M. Savin *In its Aviation and Space Med.* Dec. 1964 p 64-67 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The possibilities of chick embryos and frog egg cells developing in a helium-oxygen atmosphere, and of chicks, white mice, and dogs living in the helium-oxygen atmosphere for

10 to 15 days were investigated. Parallel experiments were performed with the same biological objects in a nitrogen-oxygen atmosphere. The results indicated that substituting helium for nitrogen in the ambient atmosphere had no appreciable effect on embryonal development. When a higher ambient temperature was maintained in order to preserve the thermal balance, long exposure to the helium-oxygen atmosphere did not impair the vitality of animals representing different stages of phylogenetic development. P.V.E.

N65-13650* National Aeronautics and Space Administration, Washington, D.C.

SOME ASPECTS OF MEDICAL EXAMINATION OF FLIGHT PERSONNEL

K. F. Borodin *In its Aviation and Space Med.* Dec. 1964 p 67-70 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The main principles behind medical examinations of flight personnel are discussed and outlined. Also discussed are the trends in research aimed at finding new methods of investigation that are compatible with flying conditions. Two main trends are considered in particular. The first trend is toward the determination of the functional capabilities of the individual with respect to concrete flying conditions, and the second is concerned with detecting incipient forms of diseases and latent functional impairments. P.V.E.

N65-13651* National Aeronautics and Space Administration, Washington, D.C.

OBESITY IN FLIERS

T. M. Buznik *In its Aviation and Space Med.* Dec. 1964 p 70-73 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The general problem of obesity is discussed. It is pointed out that there are many factors which affect the development of obesity, such as food intake, metabolic impairment, and psychological factors. It is suggested that obesity should be eliminated as slowly and as imperceptibly as it usually develops. P.V.E.

N65-13652* National Aeronautics and Space Administration, Washington, D.C.

FUNCTIONAL EVALUATION OF BLOOD CIRCULATION FROM CHANGE IN CIRCULATION EFFECTIVENESS. VALUE OF THE METHOD IN SELECTING AND TRAINING FLYING PERSONNEL

P. V. Buyanov *In its Aviation and Space Med.* Dec. 1964 p 73-76 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Oxygen utilization and cardiac output both under conditions of complete physical rest and after various actions (measured physical exercise, breathing at a high pressure, oxygen deficiency, and hypodynamia) were investigated simultaneously. The concept of an index of blood circulation effectiveness was introduced. This index is determined from the volume of blood used per 100 m³ of oxygen utilized by the body. From the data obtained the following conclusions are suggested: (1) The differences observed in blood circulation in relation to oxygen utilization are connected with the state of the mechanisms of blood circulation regulation. (2) The value of the index of circulation effectiveness lies in qualitatively characterizing the functional state of blood circulation in satisfying the energy requirements of the body. P.V.E.

N65-13653* National Aeronautics and Space Administration, Washington, D.C.

FUNCTIONAL CHANGES IN THE CARDIOVASCULAR SYSTEM AFTER EXPOSURE TO HYPODYNAMIA

Yu. V. Vanyushina *In its Aviation and Space Med.* Dec. 1964 p 76-78 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

An attempt was made to determine how the cardiovascular reflexes that resist gravity might change in human beings required to remain a long time in circumstances that limit reflex impulses from the muscles and cardiovascular system. Experiments involving subjects immobilized for 5.5 to 10.5 days in a special armchair in a position of maximum muscular relaxation and involving subjects who remained suspended in a tank of water for 5.5 to 11.5 days were performed. It was found that in human beings remaining for a long period of time under conditions of limited mobility, the adaptive reactions of the cardiovascular system to the force of gravity decrease. The weakening of the mechanisms was manifested during orthostatic testing, by a sharp acceleration of the pulse, a drop in systolic and pulse pressure, and slight cerebral anemia. P.V.E.

N65-13654* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF SOME DRUGS ON TOLERANCE OF ACCELERATIONS

P. V. Vasil'yev and V. Ye. Belay *In its Aviation and Space Med.* Dec. 1964 p 79-84 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Data obtained in experiments with sympathomimetic amines and anesthetics are presented. The experiments were performed on mice, rats, rabbits, and dogs. The results obtained included the following: (1) Intramuscular injection of 0.17 mg/kg of norepinephrine 15 to 30 min. before rotation led to a delay in the onset of bradycardia. (2) Intravenous injection of 0.025 mg/kg to 0.1 mg/kg of norepinephrine 2 to 3 min. before rotation produced contradictory data as did administration of 0.1 to 1 mg/kg of epinephrine. (3) Intraperitoneal injection of 0.8 to 1 mg/kg of amphetamine 15 to 30 min. before acceleration increased the resistance of mice as did 1.0 mg/kg of ephedrine. (4) Injection of 200 mg/kg of chloral hydrate 15 min. before the start of rotation increased resistance by 2 to 10 units, whereas a 400 mg/kg dose reduced it from 65 to 48 units. (5) A dose of 30 mg/kg of pentothal sodium increased tolerance of accelerations by 4 to 19 units, but a 100 mg/kg dose reduced it by 14 units. P.V.E.

N65-13655* National Aeronautics and Space Administration, Washington, D.C.

STRUCTURAL AND CYTOCHEMICAL INVESTIGATIONS OF THE UTRICLE UNDER THE CONDITIONS OF RELATIVE REST AND AFTER EXPOSURE TO ACCELERATIONS

Ya. A. Vinnikov, O. G. Gzenko, L. K. Titova, A. A. Bronshteyn, and V. I. Govardovskiy *In its Aviation and Space Med.* Dec. 1964 p 85-87 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Electron microscopic studies of the utricle of mammals (guinea pigs and rhesus monkeys) and birds (pigeons) at relative rest revealed the presence of evolutionary gradations reflecting the ecological conditions of locomotion of these animals in a gravitational field. The utricle of the animals contained colunar hair cells supplied with button-like synapses, as well as jug-shaped sensory cells enclosed in cup-shaped synapses. In the cup, the guinea pigs have only one, the monkeys two, and the birds about five hair cells. Changes in structural and cytochemical organization of hair cells in the synapses of the utricle after acceleration are apparently characteristic of a state of excitation and transmission of impulses. The state is accompanied by a chain of biochemical processes that take place in a strictly determined substructural location. The processes are related to nucleic acid function, to oxidation enzyme activity, and to acetylcholinesterase activity. P.V.E.

N65-13656* National Aeronautics and Space Administration, Washington, D.C.

OXYGEN SUPPLY OF THE HEART DURING RESPIRATION AT EXCESS PRESSURE

V. G. Voloshin *In its Aviation and Space Med.* Dec. 1964 p 87-90 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A series of chronic and pressure-chamber experiments on the coronary blood flow of dogs breathing at excess pressure are discussed. After exposure to noncompensated excess pressure, there was generally a decrease in the coronary blood flow followed by a slight increase. The removal of excess pressure resulted in an increase in the blood flow above the original level followed by a return to normal. Altitude experiments carried out in a pressure chamber frequently caused an increase in the coronary blood flow. The application of excess pressure caused a more or less appreciable increase in the blood flow; as the pressure and "altitude" increased, the blood flow decreased, with an eventual increase at high "altitudes". The results also confirmed the fact that excess pressure causes myocardial hypoxia, the degree varying with the amount of pressure. P.V.E.

N65-13657* National Aeronautics and Space Administration, Washington, D.C.

ENSURING RADIATION SAFETY ON THE FLIGHTS OF ASTRONAUTS YU. A. GAGARIN, G. S. TITOV, A. G. NIKOLAYEV, AND P. R. POPOVICH

Yu. M. Volynkin, V. V. Antipov, N. N. Dobrov, M. D. Nikitin, and P. P. Saksonov *In its Aviation and Space Med.* Dec. 1964 p 90-93 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Radiation dangers that might be encountered in orbital space flights are discussed. Various data on the radiation in space are considered, and the radiation protective measures for the Vostok flights are outlined. Radiation safety was improved by structural features that prevented cosmic radiation, as well as manmade radiation, from penetrating the cabin of the spacecraft and by providing antiradiation drugs to be taken in case the radiation situation deteriorated greatly. Also discussed are the results of radiation dose measurements taken onboard the flights: The doses for Vostok flights one through four were 0.6 ± 1.5 , 12 , 43 ± 1 , and 32 ± 1 mrad, respectively. P.V.E.

N65-13658* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN CARDIAC ACTIVITY DURING PROLONGED LATERAL ACCELERATIONS

A. D. Voskresenskiy *In its Aviation and Space Med.* Dec. 1964 p 94-97 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The hemodynamic changes caused by lateral acceleration of dogs were studied. The animals were exposed to acceleration bursts of 3, 6 and 9 g, of 1, 4, and 1 minute duration, respectively. Both back-chest (90° angle to the inertial force) and equal back-chest and pelvis-head (45° angle) components of acceleration were tested. The oxygen content of both the arterial blood flow and the coronary sinus blood flow was observed and standard EKG's were made. A relationship between the O_2 content of the arterial blood and the intensity and duration of the acceleration was established. The decrease in O_2 content of the arterial blood and the intensity and duration of the acceleration was established. The decrease in O_2 content of the coronary sinus blood was accompanied by an increased sinus blood outflow to meet the heart's oxygen requirements. At the 45° angle, the outflow of the sinus decreased sharply, arrhythmia and ventricular extrasystoles appeared, and irregular EKG patterns were observed. G.G.

N65-13659* National Aeronautics and Space Administration, Washington, D.C.

INTERRELATION OF HEMODYNAMIC CHANGES AND RESPIRATION DURING ACCELERATIONS

P. F. Vokhmyanin *In its Aviation and Space Med.* Dec. 1964 p 97-99 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Head-pelvis acceleration of dogs has shown that the vascular tone and venous pressure increase due to elevation of the intrapulmonary pressure. The motor protective reflexes are closely connected with respiration, activity of the diaphragm, and muscles of the chest and larynx during acceleration, and lead to expansion of the lungs and cyclical resistance to exhalation. A prolonged slowing of the blood circulation may result in hypoxia. G.G.

N65-13660* National Aeronautics and Space Administration, Washington, D.C.

INVOLVEMENT OF THE VESTIBULAR APPARATUS IN REGULATING THE BLOOD SUGAR LEVEL

R. Kh. Gambarova *In its Aviation and Space Med.* Dec. 1964 p 100-102 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A group of rabbits without functioning vestibular apparatuses, as well as normal and drugged animals, were exposed to various rates and duration of rotation. The changes in blood sugar levels were determined before and after acceleration. The bilateral destruction of the vestibular apparatus increased the blood sugar content, which was little affected by subsequent rotation of the animal. A dependence of the blood sugar level on the number and rate of rotations was observed in the unaltered rabbits. The administration of caffeine and bromide changed the interoceptive metabolic reflexes from the vestibular apparatus. G.G.

N65-13661* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN THE BIOELECTRIC ACTIVITY OF DIFFERENT PARTS OF THE BRAIN DURING EXPOSURE TO PROLONGED ACCELERATIONS

O. G. Gazenko, B. B. Yegorov, G. V. Izosimov, Yu. P. Limanskiy, A. N. Rasumeyev et al *In its Aviation and Space Med.* Dec. 1964 p 102-105 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The bioelectric activity of the frontal, parietal, and occipital regions of the cerebral cortex was observed by mono- and bipolar EEG leads on a group of 18 men during head-pelvis as well as back-chest acceleration. The development of phase processes in the cortex was accompanied by a gradual fall in arterial pressure. The original bioelectric activity was gradually restored in the aftereffect period and became normal after 5 to 7 minutes. Further acceleration studies with 50 rabbits and microelectrode investigations of the brainstem reticular formation of cats showed that the inhibition of the reticular formation acts to protect the cerebral cortex from the injurious effects of acceleration. In general, prolonged accelerations cause significant changes in the bioelectrical activity of different parts of the brain that are evident from the onset of acceleration. G.G.

N65-13662* National Aeronautics and Space Administration, Washington, D.C.

ANTICIPATING REACTIONS IN FLIGHT ACTIVITY

S. G. Gellershteyn *In its Aviation and Space Med.* Dec. 1964 p 105-107 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Stimulus-and-reaction in the behaviorist interpretation does not accurately reflect the true nature of the sensorimotor

activity of fliers in critical situations. This is proven by psychological analysis of the processes that characteristically take place; there is a genuine process of anticipation based on knowledge, past experience, or recognition of the logic of the development of events. If the expected events occur, the flier, thanks to anticipation, is better prepared to cope with them, and his actions are not only sounder but quicker. It is concluded that steps should be taken to study the anticipating processes for possible use in selection and training of flight personnel and in control of accidents. D.S.G.

N65-13663* National Aeronautics and Space Administration, Washington, D.C.

DATA ON THE BEHAVIOR AND SOME FUNCTIONS OF PERSONS KEPT UNDER THE CONDITIONS OF LIMITED MOBILITY

M. A. Gerd *In its Aviation and Space Med.* Dec. 1964 p 107-111 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In this study of limited mobility effects, a total of 12 experiments lasting 2, 5, 7, and 10 days were conducted in which the subjects (healthy persons of 20 to 22 years of age) were placed in an armchair in a semi-reclining position—a position of maximum muscular relaxation. The techniques used to study motor activity and behavior included recording of movements, time study, and recording of actograms. Also, processes of excitation and inhibition in the CNS were studied, and daily inquiries and observations were made. The results showed that motor behavior, mental state, and several physical functions changed considerably in 10 out of 12 subjects. Analysis revealed that the changes, despite the variety of forms, fell into general patterns with characteristic features and five separate periods. It was concluded that, although the degree of immobilization used is close to the limits of tolerance, it can continue for more than 10 days without prolonged aftereffects, and complete restoration of all functions occurs in 2 to 4 days. D.S.G.

N65-13664* National Aeronautics and Space Administration, Washington, D.C.

THE PHYSIOLOGICAL-SANITARY JUSTIFICATION FOR SUBSTITUTING A LUMINOUS SUBSTANCE OF INTERMITTENT ACTION FOR THE PHOSPHOR NOW USED ON AIRPLANE INSTRUMENT DIALS

V. Ya. Gilinskiy and A. Ya. Loshak *In its Aviation and Space Med.* Dec. 1964 p 111-113 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The conclusions of the investigations are as follows: (1) Instrument panels painted with a luminous substance of constant action should be changed owing to the relatively high radioactivity. (2) Lighting instrument panels with luminous substances of intermittent action irradiated by UFO armatures is effective. (3) Of the two types of instrument panel lighting described, the more useful is the FKP-03K green-colored zinc sulfide. Author

N65-13665* National Aeronautics and Space Administration, Washington, D.C.

THE EFFECT OF LOW CONCENTRATIONS OF CARBON MONOXIDE ON MAN IN PRESSURIZED CABINS OF PASSENGER PLANES

V. A. Gilinskiy, A. V. Chapek, A. G. Kozlova, N. M. Kulikova, and A. Ya. Loshak *In its Aviation and Space Med.* Dec. 1964 p 113-115 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The effects of low concentrations of carbon monoxide were studied on about 170 persons in pressure chamber experiments and actual airplane flights. A 3-hour exposure to carbon monoxide—starting with 0.01 mg/l or more—had adverse effects on the higher nervous activity, functions of the visual

and vestibular analyzers, metabolic processes, cardiovascular system, muscular strength, tissue respiration, and leukopoiesis. A maximum permissible concentration of 0.01 mg/l carbon monoxide in pressurized passenger airplane cabins is suggested. G.G.

N65-13666* National Aeronautics and Space Administration, Washington, D.C.

MORPHOLOGICAL CHANGES IN THE NERVOUS SYSTEM OF ANIMALS SUBJECTED TO LATERAL ACCELERATIONS

B. S. Glushkov *In its Aviation and Space Med.* Dec. 1964 p 115-116 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Various divisions of the nervous system of seven rabbits were histologically investigated after the animals were exposed to single, lateral accelerations from 4.9 to 5.9 g for 60 to 180 seconds. Varying degrees of hemorrhaging were observed in the gray substance of all spinal cords and in the brains of four rabbits. Reversible cell changes were noted in the second and third layers of the cerebral cortex and the hippocampus. It is concluded that the morphological acceleration changes are caused by the disorder of the blood circulation in the CNS. G.G.

N65-13667* National Aeronautics and Space Administration, Washington, D.C.

SOME FUNCTIONAL CHANGES IN MAN AFTER PROLONGED ISOLATION

F. D. Gorbov, V. I. Myasnikov, and V. I. Razdovskiy *In its Aviation and Space Med.* Dec. 1964 p 116-119 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Stress and fatigue parameters were observed on 18 subjects, confined for 10 to 15 consecutive days in a small chamber under practically complete isolation from outside stimuli. Simultaneous recordings of psychological and physiological indices were used to ascertain the qualitative aspects of the changes that took place, and to determine the state of tension and fatigue. The monotony of the surroundings, the limitations of external expressions, and the solitude were elementary in the development of stress and fatigue and should be prevented by effective stimulation. G.G.

N65-13668* National Aeronautics and Space Administration, Washington, D.C.

THE MAIN PROBLEMS IN INVESTIGATING SHOCK OVERLOADS ARISING IN FLIGHTS ON AIRPLANES

S. A. Gozulov and G. P. Mirolubov *In its Aviation and Space Med.* Dec. 1964 p 119-121 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Various groups of animals were exposed to shock overloads at high landing speeds, caused by catapulting followed by a parachute landing. Their physiological reactions were characterized by impairment of the rate and depth of respiration up to complete standstill, disruption of the rate and depth of respiration up to complete standstill, disruption of the cardiac system, change in arterial pressure, etc. The gross morphological and histological picture shows lung injuries to be the most frequent followed by liver, spleen, and intestine damage, in this order. Immersion in a liquid was found to reduce the landing impact, and the use of a gypsum bed permitted a safe landing on hard ground at a speed of 14 m/sec, which results in an impact of 1000 units. It was concluded that techniques should be developed and used for an early diagnosis of overload disorders in man to indicate the limit of physiological endurance and to investigate the biodynamic reactions of the body to shock overload. G.G.

N65-13669* National Aeronautics and Space Administration, Washington, D.C.

INCREASING RESISTANCE TO OXYGEN DEFICIENCY BY MEANS OF DRUGS

G. I. Gurvich and K. S. Shadurskiy *In its Aviation and Space Med.* Dec. 1964 p 121-123 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Derivatives of indole and hydrazine were studied for their effects on oxygen deficiency resistance. Groups of guinea pigs, rats, and mice received 0.2 mg/kg serotonin intramuscularly 1 hour before exposure to hypoxia at 11000 m elevation. The resistance to acute oxygen starvation was much higher in the experimental animals than in the controls. Experiments with 100 mg/kg iproniazid administered intraperitoneally in 150 white mice also produced considerable resistance to hypoxia, especially when the drug was injected 2 to 7 days before the exposure to oxygen deficiency. Oral administration of 5 mg/g BAS daily for 5 days in rats and mice increased the life span of the experimental animals at an "altitude" of 11000 m far above that of the control group, and was even effective 10 days postdrug. Administration of indole I, indole IV, and indole XXIX to 140 mice increased their resistance to hypoxia also. It was concluded that the derivatives of indole and hydrazine can be very effectively used to increase resistance to oxygen deficiency. G.G.

N65-13670* National Aeronautics and Space Administration, Washington, D.C.

WHITE RAT RESPIRATION AFTER PROLONGED EXPOSURE TO RADIAL ACCELERATIONS

V. I. Danilevko, A. I. Nazarenko, and O. S. Savchenko *In its Aviation and Space Med.* Dec. 1964 p 123-126 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The relationship between the biological effect of gravitational action and the body mass of small animals was confirmed on white rats. The oxygen utilization and respiratory rate of the animals were observed during centrifugal acceleration up to 50 units of varying duration. Respiratory movements were markedly impaired with increased acceleration. The oxygen utilization increased even with accelerations of 17 units lasting 5 minutes. A statistically significant increase in oxygen consumption by brain tissue was found after accelerations of 50 units lasting 1-1/2 minutes. The temperatures in the rectum and viscera of the white rats dropped simultaneously after prolonged intense gravitation by 10 or more degrees. It was concluded that the respiratory functions in a body, exposed to intense gravitation, change in all the components of respiration. G.G.

N65-13671* National Aeronautics and Space Administration, Washington, D.C.

IMPAIRMENT OF THE MECHANISM OF MITOSIS IN MICROSPORES AFTER FLIGHT ON VOSTOK 3 AND VOSTOK 4

N. L. Delone, P. R. Popovich, V. V. Antipov, and V. G. Vysotskiy *In its Aviation and Space Med.* Dec. 1964 p 126-130 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Cut *Tradescantia* stems with inflorescences were taken on Vostok space flights and then analyzed by the acetocarmine method for metaphase, anaphase, and telophase mitotic changes, as well as binucleate pollen. The figures of the normal course of mitosis in *Tradescantia paludosa* microspores were changed, reflecting both impairment in the regular movement of the nucleus and impairment in the mechanism of mitosis itself. In other experiments, a 400-r dose of X-rays had no effect at all on the microspores, nor did accelerations of 5000 g impair mitosis. This led to the assumptions that only a fairly high

dosage of ionizing radiation will disturb mitosis, and that the presence of weightlessness prevented acceleration damage. G.G.

N65-13672* National Aeronautics and Space Administration, Washington, D.C.

QUALITATIVE (STAGE) EVALUATION OF FLIGHT FATIGUE

Ye. A. Derevyanko *In its Aviation and Space Med.* Dec. 1964 p 130-133 ref (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Indices of the CNS were studied by a number of methods of varying sensitivity to developing fatigue. Data from the following parameters were used to develop a stage system of evaluating the depth of fatigue: subjective condition of the flier, observations of the fliers' behavior, nature of the flights, dynamics of nervous and mental tension, and results of methodical investigations. G.G.

N65-13673* National Aeronautics and Space Administration, Washington, D.C.

PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF INSTRUMENT FLYING

Ye. A. Derevyanko and N. D. Zavalova *In its Aviation and Space Med.* Dec. 1964 p 134-136 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Visual information in instrument flying requires the pilot to process the information about the spatial position of the plane, and to synthesize the individual signals into a complex image. An analysis of a pilot's action in controlling an airplane shows that the sensorimotor coordination of movements to control the craft constitutes his most complicated work during flight. This coordination of movements with instrument readings can be eased by the installation of instruments that yield coded information and decide for the pilot the amount, intensity, and smoothness of movements required for control purposes. G.G.

N65-13674* National Aeronautics and Space Administration, Washington, D.C.

SELECTION OF INDIVIDUALS FOR FLIGHT TRAINING

T. T. Dzhmagarov *In its Aviation and Space Med.* Dec. 1964 p 136-138 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A combined study of certain motor abilities and individual psychological traits conducive to successful flight training was used as a basis for a new selection method, which incorporated a special physical training program to eliminate individual shortcomings revealed during the selection examination. Emphasis was placed on the motor abilities in conjunction with exercises involving diversion of attention and artificially stimulated emotional stress. This training led to better coordination and precision of movements, increased speed of movements and actions, and the ability to divide and switch attention, as well as to emotional stability and techniques of mastering tensions. The effectiveness of these methods was confirmed by the accuracy and the degree of effectiveness in forecasting highly successful flight candidates. G.G.

N65-13675* National Aeronautics and Space Administration, Washington, D.C.

THE POSSIBILITY OF SUBSTITUTING HELIUM FOR NITROGEN IN THE CABINS OF SPACECRAFT

A. G. Dianov and A. G. Kuznetsov *In its Aviation and Space Med.* Dec. 1964 p 138-140 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The feasibility of substituting helium for nitrogen in the microclimate of space cabins was studied on two groups of subjects who remained in a helium-oxygen mixture for 10 and 25 days, respectively. The heat exchange of the subjects was markedly affected, resulting in a cooling sensation with lowering of the skin temperatures. The heat comfort zone during daytime ranged from 24.5° to 27.5° C and at night from 26° to 29° C. The general sense of well-being, the behavior, and the efficiency of the subjects were not affected. A pronounced change was observed in the speech volume by the shift of the spectrum toward the higher frequencies by 0.7 octave. The clarity of speech deteriorated somewhat. It was concluded that man can remain up to 25 days in a pressurized cabin in which helium is substituted for atmospheric nitrogen. G.G.

N65-13676* National Aeronautics and Space Administration, Washington, D.C.

EXCRETION OF 17-OXYCORTICOSTEROIDS IN AN INVESTIGATION OF THE EFFICIENCY OF AIRPLANE CREWS ON LONG NIGHT FLIGHTS

I. G. Dlusskaya, F. L. Kosmolinskiy, and N. A. Fedorov *In its Aviation and Space Med.* Dec. 1964 p 140-143 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The nervous system controls the maintenance of homeostasis through hormone secretions of the pituitary-adrenal system, which responds with increased output during stress situations. The total amount of bound and free 17-oxycorticosteroids in urine collected during long night flights was determined for several crews. It was found that the hormonal reactions in the captains and controllers or in the controllers and second pilots on the same flight were similar and assumed the form of parallel curves on graphs. This led to the conclusion that the amount of steroid hormones in urine increases in connection with the complexity of the performed task. G.G.

N65-13677* National Aeronautics and Space Administration, Washington, D.C.

VESTIBULAR INFLUENCES ON THE SMOOTH MUSCLES OF THE SMALL INTESTINE AND BLOOD VESSELS AFTER TRANSECTION OF THE SPINAL CORD AND VAGUS, CERVICAL SYMPATHETIC, AND SPLANCHNIC NERVES

A. S. Dmitriyev and Ye. V. Burko *In its Aviation and Space Med.* Dec. 1964 p 143-146 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The motility of the ileum, the tone of the intestinal wall, the blood pressure, and the respiration of 44 anesthetized dogs undergoing rotation were observed continually by mechanograms. Vestibular tests were made after transection of various trunk nerves and the spinal cord, and after bilateral labyrinth destruction. The ideal motility of all dogs was inhibited during the rotation, with return to normal in most cases after subsequent labyrinth destruction. The second series of experiments showed that the inhibition of the intestinal motility by acceleration persisted after bilateral transections of the vagus and cervical sympathetic nerves, but the changes in motility disappeared after exclusion of the labyrinths. It was concluded that the vestibular reactions can be executed by nervous as well as humoral mechanisms. G.G.

N65-13678* National Aeronautics and Space Administration, Washington, D.C.

SOME DATA ON AN INVESTIGATION OF CHAIN CONDITIONED MOTOR REFLEXES IN ANIMALS AFTER LONG EXPOSURE TO AN ALTERED GAS MEDIUM

G. P. Doronin *In its Aviation and Space Med.* Dec. 1964 p 147-149 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The method of chain conditioned motor reflexes was applied to white rats to investigate the complex stimuli that act in a definite sequence on a living organism under conditions of normal and high CO₂ content in the inhaled air at altitudes of up to 10000 m. A pCO₂ of about 14-mm Hg induced fluctuations in the time of execution of the individual links in the chain during the first 2 to 3 days, but did not affect the structure of the chain reflex. A higher pCO₂ (35.6 mm Hg) produced pronounced impairment of the established system of conditioned reflexes. The chain motor reflexes were restored during the second week of exposure to these conditions, but at a somewhat different level. Exposure to brief hypoxia at an altitude of 4000 to 5000 m impaired the structure of the chain motor reflexes, and phase states appeared. It was concluded that the method of chain motor reflexes is a highly sensitive and useful for testing. G.G.

N65-13679* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN THE CAPACITY OF THE CENTRAL NERVOUS SYSTEM WHILE LEARNING TO PILOT A TRAINING PLANE
V. A. Yegorov *In its Aviation and Space Med.* Dec. 1964 p 150-152 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The change in capacity to receive and process information was studied on 48 untrained persons using a TL-1 flight trainer. A total of 538 experiments required each subject to react to various radio commands by moving the proper levers on the trainer. A definite relationship was observed between the time required for processing the information and the complexity of the necessary movements. The time required to process 1 bit of information with simple movements was 0.096 to 0.117 sec. and, with complex movements, 0.180 to 0.189 sec. This difference gradually leveled out during training, paralleling the development of skills. A mean correlation of 0.94 was found between the capacity displayed in the above-described tests and the quality of execution of flight. G.G.

N65-13680* National Aeronautics and Space Administration, Washington, D.C.

CHANGE IN BACK PRESSURE ON THE BODY AND TOLERANCE OF RESPIRATION AT EXCESS PRESSURE

A. V. Yerebin and V. N. Alifanov *In its Aviation and Space Med.* Dec. 1964 p 152-154 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The correct fitting of the altitude-compensating suit (ACS), for providing uniform pressure on all parts of the body equal to intrapulmonary pressure, was studied on a number of subjects breathing under varying pressures. A variety of functional changes was observed during breathing of oxygen at excess pressure of 55, 104, 126, or 136 mm Hg on the ground and at an altitude of 20 km in a pressure chamber; duration of each exposure was no more than 5 minutes. Changes in the external back pressure on the entire body, and also on individual parts of the body were used to simulate defects of the ACS. It was found that a discrepancy of more than 50 mm Hg between pressure of the ACS suit on the body and intrapulmonary pressure resulted in marked and labored breathing and cardiovascular changes, thus impairing respiration tolerance at excess pressure. A good compensation of the abdomen and upper part of the thighs was of the greatest importance. At an altitude of 20 km, even a slight decrease in back pressure on the body was tolerated for more than 5 minutes. G.G.

N65-13681* National Aeronautics and Space Administration, Washington, D.C.

EFFECT ON MAN OF PROLONGED EXPOSURE TO ATMOSPHERE WITH A HIGH CO₂ CONTENT

S. G. Zharov, Ye. A. Il'in, Ye. A., Kovalenko, I. R. Kalinichenko, L. I. Karpova et al. *In its Aviation and Space Med.* Dec. 1964 p 155-158 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The prolonged exposure of two men to an atmosphere of high CO₂ concentration was studied in two experiments. The subjects were exposed for 30 days to air containing either 1% or 2% CO₂. No significant effects on the sense of well-being, efficiency, or basic physiological functions were observed in the first experiment. The prolonged exposure to 2% CO₂ in air resulted in a large accumulation of both free and chemically bound CO₂ in the blood. Signs of acidosis, hypodynamics, and fatigue developed and intensified with the duration of the exposure. All changes were wholly reversible. G.G.

N65-13682* National Aeronautics and Space Administration, Washington, D.C.

EVALUATING THE BIOLOGICAL EFFECTIVENESS OF SPACE FLIGHT FACTORS BY MEANS OF THE LYSOGENIC BACTERIA E. COLI K-12 (λ)

N. N. Zhukov-Verezhnikov, I. N. Mayskiy, V. I. Yazdovskiy, A. P. Pekhov, N. I. Rybakov et al. *In its Aviation and Space Med.* Dec. 1964 p 158-160 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Suspensions of a 5-hour culture of the lysogenic bacteria *E. coli* K-12(λ) were taken on Vostok space flights to observe their phage production induced by ionizing radiation. A specific antiphage serum was employed to inactivate the spontaneously originating phage particles. Laboratory experiments were also performed using combined and separate exposures of the suspension to gamma rays and vibrations. It was found that the number of phage particles in the experimental batches exposed to space flight exceeded that in the controls. This inducing effect persisted for 48 to 72 hours after landing. The effects of vibrations ranging from 35 to 700 cps suggest that vibration is a major factor in the radiogenetic effect in the lysogenic bacteria. The combined action of vibration and gamma irradiation followed by vibration intensified the biological effect of the gamma rays almost twofold. G.G.

N65-13683* National Aeronautics and Space Administration, Washington, D.C.

MODERN GENETICS AND PROBLEMS IN SPACE BIOLOGY

N. N. Zhukov-Verezhnikov, M. N. Volkov, V. I. Yazdovskiy, I. N. Mayskiy, P. P. Saksonov et al. *In its Aviation and Space Med.* Dec. 1964 p 161-164 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

An overall view of future research to develop genetic safeguards for space travel is presented, on the basis of new information derived from a genetic analysis of the offspring of *Drosophila* and lysogenic bacteria that were carried on various Vostok space flights. The experiments with lysogenic bacteria imply that a combination of vibrations and γ-rays followed by vibrations almost doubled the genetic effects of the γ-rays. However, since effective levels of cosmic radiation were lacking in the orbits, it is assumed that weightlessness may be a possible source of genetic effects. The selection of lysogenic bacteria is advocated for future research to develop substances, to prevent genetic changes, to determine the effects of weightlessness, and to study blocking of the pathological information present in the DNA of these bacteria. G.G.

N65-13684* National Aeronautics and Space Administration, Washington, D.C.

IMPAIRMENT OF PROTECTIVE MECHANISMS FOLLOWING EXPOSURE TO AN ALTERED GAS MEDIUM

V. N. Zagryadskiy and Z. K. Sulimo-Samuylo *In its Aviation and Space Med.* Dec. 1964 p 164-167 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The capacity of the organism to withstand high concentrations of carbon dioxide, which cause hypercapnia, as well as the factors that trigger the elimination of the carbon dioxide from the body were studied on humans and animals. The protective increase in human pulmonary ventilation was not effective at a CO₂ concentration above 3%. A prolonged exposure to low concentrations of CO₂ resulted in a high excitation of the cardiovascular center, and caused a diminished resistance to lateral accelerations and to breathing of oxygen at excess pressure. Prolonged hypocapnia in animals actuated the mechanisms that intensify the production of CO₂ in tissues, and resulted in vascular reflex changes. The impairment of CNS function in hyper- and hypocapnia results in inhibition or impairment of the compensatory reactions that maintain homeostasis. G.G.

N65-13685* National Aeronautics and Space Administration, Washington, D.C.

AN INVESTIGATION OF HIGHER NERVOUS ACTIVITY AND SOME MOTOR REACTIONS IN MAN UNDER CONDITIONS OF BRIEF WEIGHTLESSNESS

A. T. Zverev and L. A. Kitayev-Smyk *In its Aviation and Space Med.* Dec. 1964 p 167-168 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The impairment of speed and accuracy of motor reactions was studied in 139 experiments with human subjects during short parabolic flights. The subjects had to move various levers during exposure to angular acceleration and Coriolis accelerations created by rotation on a special armchair. Objective recordings of the test data showed that it was more difficult to work accurately during weightlessness than in the periods of acceleration. It is believed that the lowering of the speed and accuracy of the motor reactions during weightlessness was due to inhibitions in the corresponding points on the cerebral cortex as a result of a change in the level of proprioceptive afferent impulses. G.G.

N65-13686* National Aeronautics and Space Administration, Washington, D.C.

SOME ASPECTS OF HEMODYNAMICS IN BREATHING OXYGEN WITH HIGH PRESSURE IN THE LUNGS

D. I. Ivanov *In its Aviation and Space Med.* Dec. 1964 p 169-172 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The rate of blood flow in the pulmonary circulation of dogs under acute and chronic pressure in the lungs was determined by radioactive tracer methods. The magnitude of the resistance to the blood flow and the incomplete systolic emptying of the right ventricle became more pronounced with the intensity of the created pressure in the lungs, and severely impaired the hemodynamics of the pulmonary circulation. The same observations were made in experiments with the local tissue blood flow in man, as well as in studies of the venous blood flow of animals while breathing oxygen with high pressure in the lungs. It was concluded that an increase in lung pressure regularly altered the linear and volumetric rate of the blood flow, resulting in hypoxia and marked changes in the venous blood circulation. G.G.

N65-13687* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN MAN'S PRINCIPAL PHYSIOLOGICAL FUNCTIONS AFTER PROLONGED EXPOSURE TO LOW BAROMETRIC PRESSURE IN A SMALL SPACE

D. I. Ivanov, V. B. Malkin, I. N. Chernyakov, V. L. Popkov, and Ye. O. Popova *In its Aviation and Space Med.* Dec. 1964 p 172-175 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The dynamics of man's physiological functions and their changes through disruption of the normal diurnal rhythm were studied on several pairs of test subjects who remained for 30 days in a small pressure chamber in a rarefied atmosphere corresponding to altitudes of 3000, 5000, and 7000 m. No clear-cut relationship between the barometric pressure and changes in the physiological indices was established. The nature and direction of physiological changes were largely determined by sleep and relaxation routines. The criterion for selections of optimal regimens should be the time of day set aside for sleep, not merely the number of hours. G.G.

N65-13688* National Aeronautics and Space Administration, Washington, D.C.

HYPOXIA AND CHEMICAL THERMOREGULATION

K. P. Ivanov *In its Aviation and Space Med.* Dec. 1964 p 175-177 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The muscular gas exchange, cold tremor, and the thermoregulation muscle tonus were investigated in order to locate the sources of controllable heat production in warm-blooded animals. The decrease of oxygen utilization in rats and rabbits during hypoxia at an ambient temperature of 10° to 25° C coincided with a depression of the muscle electrical activity. The oxygen utilization of the rabbit femoral muscles increased 30% to 150% through the stimulation of the thermoregulation tonus, and 200% to 400% through stimulation of the cold tremor reflex. A positive correlation between suppression of the electrical activity of muscles and the gas exchange was established. It was concluded that hypoxia influences and inhibits the central thermoregulatory mechanism through a decrease of the sum of impulses flowing to the hypothalamus from the cold receptors of the skin. G.G.

N65-13689* National Aeronautics and Space Administration, Washington, D.C.

THE TIME RESERVE IN STEADILY DECREASING ALTITUDE

L. S. Isaakyan *In its Aviation and Space Med.* Dec. 1964 p 177-179 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The time reserve that ensures retention of consciousness in hypoxia is studied. This study begins with the subject's reaching a given altitude quickly, and continues until the appearance of the earliest signs of oxygen deficiency, followed by a rapid emergency descent to an altitude of 4.5 km as soon as the first signs of acute hypoxia appear. Various biological parameters were measured to detect the state of altitude syncope. Eighty-four control experiments were performed on nine dogs to determine the static time reserve (time before losing consciousness) at 9-, 10-, and 11-km altitudes. The ratios of static time reserves for the dogs at the three altitudes were the same as the corresponding ratios for human beings at the same altitudes. Forty-seven experiments were performed on the same nine dogs to determine the relationships between static and dynamic time reserves. It is supposed that relationships between static and dynamic time reserves in dogs also have their counterparts in man. D.E.W.

N65-13690* National Aeronautics and Space Administration, Washington, D.C.

EVALUATION OF THE DEGREE OF TENSION IN PILOTS EXECUTING LANDINGS IN VARIOUS TYPES OF MODERN AIRPLANES UNDER ORDINARY CONDITIONS

L. S. Isaakyan *In its Aviation and Space Med.* Dec. 1964 p 179-184 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In response to a questionnaire, individual pilots indicated the main factors in neuropsychic tension to be the physical efforts applied to control devices, the speed of planning and of the ground approach, and the total time used in completion of the landing during the final approach. The total impulse of the pilots' static efforts was computed by integrating the forces applied to the control wheel over a 20-second period spanning touchdown. The volume of information to be perceived and processed was combined with the time available during the approach and landing to obtain a logarithmic function. Various physiological parameters were measured in actual landings and were correlated with the calculated tension-producing factors. A relationship was found for which a mathematical expression was derived. D.E.W.

N65-13691* National Aeronautics and Space Administration, Washington, D.C.

SOME RESULTS OF A CLINICAL AND PHYSIOLOGICAL STUDY OF SENIOR PILOTS OF THE CIVIL AIR FLEET

L. S. Isaakyan, D. S. Kuleshov, A. V. Chapek, V. M. Kozin, A. A. Shishova et al *In its Aviation and Space Med.* Dec. 1964 p 184-187 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The reasons for the disqualification of pilots of the Civil Air Fleet were analyzed for age-related pathology. The most important reasons were cardiovascular pathology (mainly atherosclerosis)-33.6%, otolaryngological diseases-9.1%, and changes in vision-7.2%. No connection was found in 51.1% of the cases between the age of pilots and any other pathology that served as a reason for discharge. A group of physically fit pilots was carefully examined using a variety of clinical, X-ray, laboratory, and electrophysiological methods. Special investigations were made of the auditory, vestibular, and visual analyzers, of higher nervous activity, and of visual memory, capacity, and concentration of attention. Results showed that the frequency of X-ray, electrocardiographic, and vectorcardiographic changes in the heart and the speed of pulse-wave propagation increased with age. It was concluded that the chief problems of aging are cardiovascular pathology, changes in visual function, and, in part, occupational changes in hearing. Early diagnosis is recommended. D.E.W.

N65-13692* National Aeronautics and Space Administration, Washington, D.C.

A THEORY CONCERNING GRAVITATIONAL INFLUENCES ON THE ORGANISM

P. K. Isakov *In its Aviation and Space Med.* Dec. 1964 p 188-192 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Changes in human physiology, particularly in gas exchange rates, are discussed for conditions of weightlessness and for one or more g-loadings. Reviewed data indicate that the rate of gas exchange rises sharply during acceleration and returns to normal after the transitional period. The threshold perception of gravity was also investigated, with the subjects' arms immobilized or free, and it was found that the differential threshold of perception of gravity decreases during weightlessness. D.E.W.

N65-13693* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF HYPOKINESIA ON CERTAIN INDEXES OF EFFICIENCY AND RESPIRATORY FUNCTION IN MAN

L. A. Kakurin, B. S. Katkovskiy, A. N. Kozlov, and N. M. Mukharlyamov *In its Aviation and Space Med.* Dec. 1964 p 192-194 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

An experimental investigation on four healthy young males showed that 20 days in bed caused marked deterioration

of human physical fitness. This deterioration was partly from hypokinesia and partly from the body's adaptation to a horizontal position. Also, the deterioration of work efficiency after remaining in bed made heavy demands on the cardiovascular and respiratory systems. D.E.W.

N65-13694* National Aeronautics and Space Administration, Washington, D.C.

OBTAINING VISUAL INFORMATION DURING INSTRUMENT FLYING

I. A. Kamyshev *In its Aviation and Space Med.* Dec. 1964 p 194-197 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The eye movements of six pilots in 16 circlings in a TL trainer were filmed with a motion picture camera. The motion pictures indicated that the gyroscopic horizon instrument was the most important since it was checked 35% to 70% of the time. It is recommended that the instrument panel be rearranged with the most frequently checked instruments grouped together. D.E.W.

N65-13695* National Aeronautics and Space Administration, Washington, D.C.

REACTIONS OF ASTRONAUTS TO BRIEF PERIODS OF WEIGHTLESSNESS

I. M. Kas'yan *In its Aviation and Space Med.* Dec. 1964 p 198-200 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

An investigation of the responses and performance of astronauts during a short, parabolic, "weightless" flight in an aircraft is reported. Results for each measured parameter are discussed separately. Brief mention is made of astronauts' sensory reactions during weightlessness. Astronauts Gagarin, Titov, Nikolayev, and Popovich were the subjects for these studies. D.E.W.

N65-13696* National Aeronautics and Space Administration, Washington, D.C.

PATHOMORPHOLOGICAL VISCERAL CHANGES IN ANIMALS AFTER ACCELERATIONS

M. I. Kas'yanov and G. P. Mirolubov *In its Aviation and Space Med.* Dec. 1964 p 201-204 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A study of the effects of a shock overload or acceleration on rats and dogs is reported. The accelerations used caused tissue injury and hemorrhages in organs, fat embolism, and a morphological picture similar to that of concussion of the brain together with degenerative changes in the ganglion cells. Traumas and focal hemorrhages developed in different parts of the organs, depending on the direction and intensity of the acceleration, on the striking of organs against the wall of cavities, and on their consistency and relative position. Reactive changes around the injured areas and focal hemorrhages as well as destructive changes in the lungs and kidneys developed later. In cases of repeated exposure, the possibility of cumulative effects as a result of repeated microinjuries stresses the need to reduce the permissible limits of accelerations on landing. D.E.W.

N65-13697* National Aeronautics and Space Administration, Washington, D.C.

QUANTITATIVE EVALUATION OF OPERATOR IN A "MAN-MACHINE" SYSTEM

Yu. V. Kiselev *In its Aviation and Space Med.* Dec. 1964 p 204-205 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Criteria of reliability for mechanical devices are discussed, and a parallel criterion of reliability for human operators of

equipment is stated: The best criterion of operator reliability in a continuous process is the probability that with correct input data the parameter of operator output will be within permissible limits at any moment of working time. In a discrete process, the criterion is the probability of correct performance of each cycle of operations. D.E.W.

N65-13698* National Aeronautics and Space Administration, Washington, D.C.

TRACE PHENOMENA IN THE CENTRAL NERVOUS SYSTEM AFTER PROLONGED OPTOKINETIC STIMULATION

V. A. Kislyakov and V. P. Neverov *In its Aviation and Space Med.* Dec. 1964 p 205-206 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Experiments on rabbits to determine the characteristics of optokinetic nystagmus after prolonged (1 and 1/2 hours) optokinetic stimulation are reported. It is concluded that reverse postoptokinetic nystagmus, which is characteristically directed to the side opposite optokinetic nystagmus, is caused by prolonged circulation of excitation in the brain structures. These properties of reverse postoptokinetic nystagmus make it possible to regard the phenomenon as a physiological model for studying the neural mechanisms of illusory reactions. D.E.W.

N65-13699* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN ELECTRIC ACTIVITY OF THE CEREBRAL CORTEX AND SUBCORTICAL FORMATIONS IN ANIMALS EXPOSED TO BRIEF PERIODS OF WEIGHTLESSNESS AND ACCELERATION

A. M. Klochkov *In its Aviation and Space Med.* Dec. 1964 p 206-209 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Changes in the bioelectric activity of different parts of the brain of animals exposed to brief periods of weightlessness and acceleration were studied. Electric activity was recorded in the following regions of the cerebral cortex: the anterior portion of the suprasylvian and ectosylvian gyri, the vital tissue zone, and the orbital zone. A partial amplitude analysis of the bioelectric activity of the cerebral cortex revealed that the magnitude of the changes differed from zone to zone. The most characteristic and pronounced changes were found in the cortical projection of the vestibular function and in the anterior portion of the suprasylvian and ectosylvian gyri. Patterns of changes in electrical activity are described. D.E.W.

N65-13700* National Aeronautics and Space Administration, Washington, D.C.

SOME SENSORY DISTURBANCES IN PERSONS EXPOSED TO WEIGHTLESSNESS

L. A. Kitayev-Smyk *In its Aviation and Space Med.* Dec. 1964 p 209-210 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Recordings were made of sensory, autonomic, motor, and other reactions of a group of subjects exposed to weightlessness for short periods of time. Observations of the following are presented for fliers and nonfliers: spatial illusions; visual reactions such as optical illusions, heightened color perception, and visual acuity; ataxia; kinesthesia; and time perception. Results show that weightlessness may impair the functioning of various sensory systems in man. D.E.W.

N65-13701* National Aeronautics and Space Administration, Washington, D.C.

THE BODY POSITION (POSTURAL REACTIONS) OF ANIMALS IN WEIGHTLESSNESS

L. A. Kitayev-Smyk *In its Aviation and Space Med.* Dec. 1964 p 211-212 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The behavior of various animals—fish, birds, and mammals—was studied during brief periods of weightlessness. It was found that, at the onset of weightlessness, fish lose ability to orient in relation to the top and bottom of the aquarium. Birds demonstrate a motor reaction resembling continuous upward flight, followed in the second or third period of weightlessness by calm suspension in a characteristic position with wings spread back. Mammals show high motor activity. An investigation of the effect of excluding visual and vestibular analyzers on the behavior of rabbits and the time they took for adaptation to weightlessness is reported. The residual vestibular sensation, the nature of the turning reaction, and the reaction to progressive movements in rabbits and cats are discussed. The occurrence of general excitation and heightened motor activity in various animals during weightlessness indicates that this factor is an adverse stimulus primarily affecting the vestibular apparatus, and that vision is the decisive factor in developing adaptation to weightlessness. D.E.W.

N65-13702* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF CENTRIFUGAL ACCELERATIONS ON THE VENOUS OUTFLOW IN THE CEREBRAL BLOOD VESSELS OF ANIMALS

V. Ya. Klimovitskiy *In its Aviation and Space Med.* Dec. 1964 p 213-214 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In continuing experiments with rabbits, venous outflow from the brain during centrifugal acceleration was investigated in the anterior sagittal sinus and major veins on the surface of the brain. Blood flow was recorded as the volumetric flow rate by means of temperature-sensitive elements, consisting of a microthermal resistance and heater, placed on both sides of the blood vessel. Centrifugal acceleration was produced in a head-pelvis direction in a centrifuge with a small arm and fixed number of revolutions per minute. Results of the first and subsequent centrifugations are contrasted. Daily decreases in blood outflow are reported for animals that were initially well conditioned, and inadequacy of blood supply to the brain is reported after the accelerations. Cerebral blood flow reaction to acceleration is said to be simply a passive, mechanical shifting of blood toward the centrifugal acceleration. In most cases, the temperature of the brain surface at the point where the temperature-sensitive element was placed changed in a very stereotyped fashion during centrifugation. D.E.W.

N65-13703* National Aeronautics and Space Administration, Washington, D.C.

PATHOGENESIS OF HEMODYNAMIC DISORDERS AFTER EXPOSURE TO A SUPERSONIC AIR STREAM

A. F. Kovalenko, Ye. Ya. Kaplan, V. P. Boyarkin, and A. M. Kiochkov *In its Aviation and Space Med.* Dec. 1964 p 214-217 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

An investigation of the changes effected in the cardiovascular and nervous systems by exposure to a supersonic airstream is reported. The effect of a 1600 km/hr airstream was studied on dogs whose arterial pressure, rate of blood flow, rate and rhythm of cardiac contractions, EKG, and the functional states of the brainstem centers and the sympathetic and parasympathetic nervous systems were recorded. A series of experiments is reported showing the effects of the airstream on animals with electrodes implanted in various cortical and sub-cortical regions. Other data indicate marked changes in excitability and conduction of the heart muscle after exposure to a supersonic airstream. Under the influence of loud sound (120 dB), the pressor reaction to constriction of the common carotid

arteries becomes more pronounced than at the beginning. The airstream caused a 20% to 30% decrease in the pressor reaction below the original level. The excitability of the respiratory center underwent a similar two-phase change. The functional states of the sympathetic and parasympathetic nervous systems following sound and air exposures are reported. D.E.W.

N65-13704* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF HYPOTHERMIA ON OXYGEN DEFICIENCY AT HIGH ALTITUDES

Ye. A. Kovalenko, V. I. Korol'kov, and Ye. A. Il'in *In its Aviation and Space Med.* Dec. 1964 p 217-220 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Experiments were performed on dogs with platinum electrodes implanted in brain tissue to obtain continuous recording, by an automatic integrating analyzer, of the EKG, pneumogram, electrocorticogram, and electrothalamogram. The partial pressure of oxygen in the brain was continuously recorded by the polarographic method in order to study the rate of deoxygenation of brain tissues. Conclusions drawn include: Shallow hypothermia (30° to 32° C) of animals quickly elevated to high altitudes does not increase the time before respiratory arrest and does not prolong survival time at these altitudes. Deeper hypothermia (2° to 23° C) helps to increase the time before respiratory standstill, but by no more than 5 minutes at an altitude of 15 000 m, and by no more than 2 minutes at 27 000 m. D.E.W.

N65-13705* National Aeronautics and Space Administration, Washington, D.C.

EFFECT ON BRAIN OXYGENATION OF BREATHING OXYGEN DURING ACCELERATIONS

Ye. A. Kovalenko, V. L. Popkov, and I. N. Chernyakov *In its Aviation and Space Med.* Dec. 1964 p 220-223 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Experiments performed on dogs with platinum electrodes chronically implanted in brain tissue are reported. The partial pressure of oxygen, pO_2 , was determined by the polarographic method in relative values. At the same time the EKG, pneumogram, and EEG were recorded. Accelerations from 2 to 12 g were produced by revolving the animals in a centrifuge for 1 to 3 minutes in longitudinal and lateral directions. Nineteen dogs were rotated 230 times. The investigation showed that prolonged accelerations invariably decrease brain oxygenation, especially when applied in a head-pelvis direction. This suggests that oxygen deficiency of the brain is important in the pathology caused by accelerations. Further evidence is provided by the fact that breathing oxygen helps to keep pO_2 on a level close to the original, even with accelerations of up to 10 g, and greatly increases the tolerance of accelerations. D.E.W.

N65-13706* National Aeronautics and Space Administration, Washington, D.C.

MORPHOLOGICAL LABYRINTHINE CHANGES IN DOGS EXPOSED TO RADIAL ACCELERATIONS

R. Ye. Kogan and S. S. Makaryan *In its Aviation and Space Med.* Dec. 1964 p 223-227 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Accelerations of varying intensity and duration applied in head-pelvis and pelvis-head directions were found to produce hemorrhages in the middle and inner ears of animals. Middle-ear hemorrhages occurred mainly in the perilymphatic spaces of the cochlea and the sacculus. No middle- or inner-ear hemorrhages were found in dogs that died during an experiment in which the rotation axis passed through the cardiac region. D.E.W.

N65-13707* National Aeronautics and Space Administration, Washington, D.C.

SPEECH AUDIOMETRY AS A METHOD OF FUNCTIONAL DIAGNOSIS IN FITNESS EXAMINATIONS OF FLIGHT PERSONNEL

V. M. Kozin *In its Aviation and Space Med.* Dec. 1964 p 227-230 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A method of speech audiometry is described which is of value in selecting persons suitable for work under noise and vibration conditions and in instituting preventive measures for persons already working under such conditions. The apparatus, composed of a tape recorder, an attenuator, telephones with rubber earpieces, a speech audiometer, and a portable sound-suppressing chamber, is described in detail. The procedures are described, and the word lists and their construction are discussed. The word lists were divided into three categories according to acoustic frequency. For normal hearing, the thresholds of intelligibility for 80% of the words were taken to be 8 dB above the tonal threshold for the general-frequency word group, 13 dB above the tonal threshold for the high-frequency word group, and 18 dB above the tonal threshold for the low-frequency group of words. A comparison with data obtained by whisper audiometry and tonal audiometry shows that this method confirms the findings of tonal audiometry and increases the precision of the whisper audiometry results. D.E.W.

N65-13708* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF FLIGHT FACTORS ON THE ADJUSTING REFLEXES

G. L. Komendantov *In its Aviation and Space Med.* Dec. 1964 p 230-233 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Various factors were studied, such as "elevations" in a pressure chamber, breathing of gas mixtures with low oxygen content, breathing of gas mixtures with little oxygen but high carbon dioxide content, increased pressure in the cavities of the gastrointestinal tract (simulation of altitude meteorism), constriction of the common carotid artery (anemia), and intense and prolonged accelerations. It was found that postrotation nystagmus is slowed in rabbits elevated in a pressure chamber to about 5 km. The addition of carbon dioxide (4.2% to 5.8%) to gas mixtures deficient in oxygen (corresponding to altitudes of 9 to 17 km) generally increased altitude resistance in rabbits; the decrease in eye muscle tone was not very sharp or was not observed at all. Experiments simulating altitude meteorism showed that gastrointestinal inflation caused ocular caloric nystagmus to slow. Results are also reported for experiments that studied the other factors listed. D.E.W.

N65-13709* National Aeronautics and Space Administration, Washington, D.C.

SOME RESULTS OF A STUDY OF THE CARDIOVASCULAR SYSTEM IN FLIERS ON DIFFERENT FLIGHTS

S. Ye. Komshalyuk *In its Aviation and Space Med.* Dec. 1964 p 233-235 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Experiments revealed that cardiovascular changes in airmen during flight depend largely on the complexity of the mission and on the degree of "newness" of the flight. The cardiovascular system was found to experience considerable strain during complex flight missions and in the course of gaining familiarity with new airplanes. In connection with pilot familiarization with new planes or execution of complex flight assignments, it is recommended that aviation physicians give both preflight and postflight physical examinations to study the nature and time of restoration of normal physiological functions, with focus on the cardiovascular system. D.E.W.

N65-13710* National Aeronautics and Space Administration, Washington, D.C.

HISTOMORPHOLOGICAL CHANGES IN DOG PANCREAS AFTER EXPOSURE TO LATERAL ACCELERATIONS

Yu. N. Kopayev *In its Aviation and Space Med.* Dec. 1964 p 235-237 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Two series of experiments were performed with 28 male dogs. The first series studied the effect of 8-g accelerations in a chest-back direction for 3 minutes. The second series studied the effect of 12-g accelerations in the same direction for 1 minute. Five intact animals of the same sex and weight served as controls. The animals were sacrificed 1 hour, 1, 3, 7, 15, 30, and 60 days after exposure—2 animals at each time. The main pancreatic changes that followed single lateral accelerations of 8 and 12 g were disorders caused by the impairment of blood circulation. In addition, definite degenerative-dystrophic changes in the parenchyma of the pancreas were noted shortly after exposure. These subsequently gave way to phenomena of a compensatory-restorative nature. The various changes that arose in the pancreas after the accelerations were all adequately compensated within 30 days of exposure. D.E.W.

N65-13711* National Aeronautics and Space Administration, Washington, D.C.

THE LATENT FORM OF MOTION SICKNESS

V. I. Kopanav *In its Aviation and Space Med.* Dec. 1964 p 238-240 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Experiments are reported in which subjects were placed in a darkened room for over 50 minutes. After stabilization of the excitability and lability indices of their visual analyzers was attained, various subjects were swayed at the rate of 16 to 17 per minute with an intensity of less than 0.15 g. Most subjects with the latent form of motion sickness exhibited a decrease in excitability and lability of the visual analyzer and slight changes in blood pressure and the cardiac rate. A definite relationship was detected between these changes and the degree of statokinetic tolerance. D.E.W.

N65-13712* National Aeronautics and Space Administration, Washington, D.C.

TRAINING MAN FOR SPACE FLIGHT

A. A. Koreshkov *In its Aviation and Space Med.* Dec. 1964 p 240-244 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

This report examines cardiovascular reactions during parachute training, exposure to vibrations, and prolonged confinement and isolation. The ability of a group of experimenters to work harmoniously together under these conditions is also reported. D.E.W.

N65-13713* National Aeronautics and Space Administration, Washington, D.C.

WEIGHTLESSNESS FROM THE STANDPOINT OF TERRESTRIAL PHYSIOLOGY

P. A. Korzhuyev *In its Aviation and Space Med.* Dec. 1964 p 242-244 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The relationship of gravity and biological development is explored. Strong emphasis is placed on the correlations found among degrees of activity in terrestrial vertebrates, their size, their habitat, and the relative sizes of the bodily organs devoted to hemoglobin synthesis. It is suggested that the vigor of the centers of hemoglobin synthesis is dependent to some extent on the gravitational field and that, if the organism were to live in a gravity-free environment, the bone marrow activity would become depressed. D.E.W.

N65-13714* National Aeronautics and Space Administration, Washington, D.C.

DEVELOPMENT AND PRESERVATION OF A HIGH LEVEL OF MOTOR FUNCTION AS A PROBLEM IN THE PREPARATION AND EXECUTION OF EXTENDED SPACE FLIGHTS
A. V. Korobkov *In its Aviation and Space Med.* Dec. 1964 p 245-247 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A study of the changes that take place in different organs and systems under conditions of hypodynamia and isolation showed that mental as well as motor and autonomic functions are affected. The marked decrease in resistance to radiation after hypodynamia indicated that the lack of physical movements and ensuing reflex and humoral stimulation exert a profound and unfavorable effect on essential processes in various organs and tissues. However, physical exercise during hypodynamia restores the quality of these functions. It was concluded from a second study that the stability of the internal environment is related to a high level of motor activity. D.E.W.

N65-13715* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF LATERAL ACCELERATIONS ON DOG LUNG HISTOLOGY

Yu. N. Korolev *In its Aviation and Space Med.* Dec. 1964 p 247-249 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Two series of experiments were performed on 28 male dogs weighing 10 to 15 kg. The first consisted of a single acceleration of 8 g in a back-chest direction for 3 minutes, the second consisted of a single acceleration of 12 g in a back-chest direction for 1 minute. The animals were sacrificed 1 hour, 1, 3, 7, 15, 30, and 60 days later. Lung tissues were removed, fixed, and examined. Hyperemia, edema of lung tissue, and hemorrhages, all indicative of impaired pulmonary circulation, were among the early changes observed. From 3 to 7 days after the experiment, inflammatory phenomena developed. Still later, there was focal sclerosis of lung parenchyma due to organization of the previously existing hemorrhages or to pneumonia. These changes did not affect the respiratory function significantly. Compensation was quite pronounced. D.E.W.

N65-13716* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF LATERAL ACCELERATIONS ON DOG KIDNEY HISTOLOGY

V. V. Korolev *In its Aviation and Space Med.* Dec. 1964 p 249-252 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Two series of experiments were performed on 28 male dogs weighing 10 kg to 15 kg. The first consisted of a single acceleration of 8 g for 3 minutes, and the second consisted of a single acceleration of 12 g for 1 minute. Two animals from each series were sacrificed with ether fumes 1 hour, 3, 7, 30, and 60 days after the acceleration. Kidney tissues were removed and stained for examination. During the first few hours and days after the experiments, venous hyperemia and focal hemorrhages around the glomerula and between the tubules were noted. Increased permeability of the walls of the capillaries of the vascular glomeruli was indicated by the erythrocytes found in the lumens of the tubules. The hemorrhages that appeared after 7, 15, and 30 days were apparently caused by increased vascular permeability and decreased neurovascular tone, which may have resulted from the ether fumes. The morphological changes were more pronounced in the first series of experiments than in the second, especially those in the vascular system. D.E.W.

N65-13717* National Aeronautics and Space Administration, Washington, D.C.

PSYCHOLOGICAL AND PHYSIOLOGICAL CHARACTERISTICS OF THE WORK OF AIRPLANE CREWS IN CONNECTION WITH IN-FLIGHT REFUELING

F. P. Kosmolinskiy *In its Aviation and Space Med.* Dec. 1964 p 252-254 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Changes in aircrew cardiac rates and respiratory rates by factors of 2 to 3 during in-flight refueling are reported. Changes after long flights included weight loss, muscle strength reduction, muscular endurance reduction, and various nervous and mental changes. Increasing the skill of pilots clearly improved the nervous and emotional strain manifestations. Changes induced by emotional excitement and strong nervous stress are enumerated. The metabolism of vitamins (especially vitamin C), cholesterol, and corticosteroids is discussed in relation to stress. Increased urinary ascorbic acid excretion was found in fliers whose work entailed extreme nervous and emotional and physical strain, while no such changes were noted for others members of the same crew who had less responsible jobs. An exceptionally high elimination rate of ascorbic acid (from 5 to 30 times above normal) is reported for fliers after high strain, whether they received diets with extra vitamin C or not. It is concluded that physiological and biochemical changes noted in the personnel after long flights with refueling in the air are directly related to the complexity of the mission. D.E.W.

N65-13718* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF PROLONGED LATERAL ACCELERATIONS ON MONKEYS

A. R. Kotovskaya, P. V. Vasil'yev, B. A. Lapin, S. F. Simpura, I. S. Grishina et al *In its Aviation and Space Med.* Dec. 1964 p 254-257 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The cardiovascular and respiratory reactions to chest-back accelerations were investigated with 11 rhesus monkeys and 5 baboons, and the duration of tolerance of 12-g accelerations was determined. The apparatus, instrumentation, procedures, and detailed observations are described. In general, the behavior and condition of the animals before, during, and after rotation and the results of cardiac and respiratory checks showed that monkeys can tolerate accelerations of 12 g in a chest-back direction for 1 to 4 1/2 minutes. Analysis and comparison of the data with observations on human beings indicate that monkeys show promise for studying the pathogenesis of many functional disorders caused by accelerations. D.E.W.

N65-13719* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF ACCELERATIONS ON LIVER STRUCTURE

Ye. F. Kotovskiy *In its Aviation and Space Med.* Dec. 1964 p 257-259 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The results of a histological study of the liver of animals subjected to lateral accelerations under specified conditions are given. Twenty-eight male dogs (2 groups of 14 animals each) weighing 10 to 15 kg were used. The first group was subjected to 8-g accelerations in a chest-back direction for 3 minutes, the second group, to 12-g accelerations in the same direction for 1 minute. Five dogs served as controls. Two animals were sacrificed 1 hour, 1, 3, 7, 15, 30, and 60 days after the experiment. Fragments of liver were taken from the ventral, central, and dorsal portions of the left lobe, and fixed and treated for examination. The first and second groups showed

similar morphological and histological liver changes, essentially of two kinds: vascular changes, and changes in hepatic cells and bile duct cells. The progress of the dogs over the 60 days following is traced histologically. It is stated that the changes in both groups of dogs were similar, although they varied in intensity. The scale of the changes was far greater in the dogs of the second group. D.E.W.

N65-13720* National Aeronautics and Space Administration, Washington, D.C.

THE USE OF HYPERVENTILATION IN SELECTING CANDIDATES FOR FLYING SCHOOL

A. K. Kochetov *In its Aviation and Space Med.* Dec. 1964 p 260-262 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A hyperventilation test with simultaneous EEG recording is described that can be of value in detecting rather delicate CNS impairments and in identifying persons with low tolerance of hypoxapnia. The latter is important in flying because of possible decreased pilot efficiency at times of great emotional stress. In the hyperventilation syndrome, no clear-cut relationship was noted between subjective sensations and brain bioelectric changes. A wide variety of changes occurred in the EEG's of examinees experiencing the disagreeable sensations characteristic of hypoxapnia. D.S.G.

N65-13721* National Aeronautics and Space Administration, Washington, D.C.

PRINCIPLES GOVERNING THE OBJECTIVE EVALUATION OF THE THERMAL STATE OF THE BODY

V. I. Krichagin *In its Aviation and Space Med.* Dec. 1964 p 262-266 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In evaluating the airman's body reserves in flight, an index of his thermal state is essential. Data are presented that can be used as criteria for evaluating the body's heat state. The gradations of thermal states described are: (1) comfortable state or complete absence of subjectively sensed information, (2) mild sensations evaluated as cool, (3) distinct sensation of general coolness, and (4) definite sensation of very cold. Similar differentiations are made for states of overheating. Criteria used include net weight loss by perspiration, skin appearance, rectal and axillary temperature, skin temperature, difference between trunk and extremity temperature, and general physiological indexes (pulse, respiration, and metabolism). D.S.G.

N65-13722* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN SOME PHYSIOLOGICAL FUNCTIONS RESULTING FROM EXPLOSIVE DECOMPRESSION

A. G. Kuznetsov, A. S. Tsvilashvili, and A. R. Mansurov *In its Aviation and Space Med.* Dec. 1964 p 267-269 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In this study of physiological effects of large and rapid pressure drops, dogs and rabbits were placed in a chamber in which the barometric pressure was greatly reduced within 0.3 to 0.004 second, and the following parameters were measured: respiration rate and rhythm, biopotentials of respiratory muscles, EKG, arterial blood pressure, and action currents from the diaphragm and vagus nerves of anesthetized dogs and non-anesthetized rabbits. In addition, roentgenography and cine-fluorography of thoracic and abdominal organs, and roentgenokymography of the diaphragm and ribs of the intact animals were performed. The data show that explosive decompression causes major changes in a very short time, that these changes are reflex in nature, and that they vary with the type of decompression. D.S.G.

N65-13723* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN RESPIRATORY AND CARDIOVASCULAR FUNCTIONS AFTER PROLONGED EXPOSURE TO LOW BAROMETRIC PRESSURE

A. G. Kuznetsov, N. A. Agadzhanian, Yu. P. Bizin, N. I. Yezepchuk, I. R. Kalinichenko et al *In its Aviation and Space Med.* Dec. 1964 p 270-272 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The dynamics of gas exchange, cardiovascular function, and peripheral blood supply were studied in two subjects after extended exposure to low barometric pressure (308 mm Hg) with normal partial pressure of oxygen (150 to 160 mm Hg). Among the effects noted were reduced oxygen utilization, reduced amount of heat emitted, decreased cardiac rate, decreased arterial blood pressure, and only very slight hematological changes. It was concluded that the physiological changes were largely due to hypodynamia which caused the metabolic level to drop; this was substantiated by the fact that the gas exchange function returned to normal 8 to 10 days after the end of the experiment. D.S.G.

N65-13724* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN THE VECTORCARDIOGRAM OF FLIGHT PERSONNEL IN EARLY STAGES OF HYPERTENSION

Ye. I. Kuznetsova *In its Aviation and Space Med.* Dec. 1964 p 272-274 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The use of vectorcardiography in evaluating the condition of the cardiovascular system was studied using data on 55 fliers, 30 to 49 years of age, of whom 25 were normal and 30 had a diagnosis of the first stage of hypertension. Vectorcardiograms were first analyzed by comparing them with electrocardiographic data and data from X-ray examination, then recorded by the five-plane system of Akulinchev. Tabulation of the results showed that the average value of the maximum vector of the QRS loop in hypertensive patients has a tendency to increase in all five planes. This is attributed to an increase in the difference of the bioelectric field of the myocardium. D.S.G.

N65-13725* National Aeronautics and Space Administration, Washington, D.C.

EKG CHANGES IN FLIGHT PERSONNEL AFTER PROLONGED NONSTOP FLIGHTS

N. M. Kulikova *In its Aviation and Space Med.* Dec. 1964 p 274-277 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Changes in the cardiovascular systems of flight personnel who were carrying out 8- to 9-hour nonstop trips in turboprop planes were determined by the EKG method. The EKG's were recorded 1 hour after the plane landed, after a 24-hour rest, and after a 2- to 3-day rest. The following conclusions were drawn from the generalized results: (1) EKG indexes in all crew members after prolonged nonstop flights do not exceed normal physiological limits. (2) The lowering of the functional capacity of the myocardium was more marked in cabin captains than in the other crew members. (3) Changes noted in the EKG's after flights were of a functional nature, since after 24 hours of rest the observed shifts were fewer, and after 2- to 3-days rest they had completely disappeared. (4) The temporary changes are regarded to be the effects of fatigue resulting from stresses of prolonged nonstop flights. D.S.G.

N65-13726 National Aeronautics and Space Administration, Washington, D.C.

PARTICIPATION OF L. A. ORBELI IN THE DEVELOPMENT OF THE PROBLEM OF COSMIC PHYSIOLOGY

A. V. Lebedinskiy *In its Aviation and Space Med.* Dec. 1964 p 277-283 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

At a conference on stratosphere studies held in the U.S.S.R. in 1935, L. A. Orbeli proposed a number of solutions to fundamental problems which are still important to research workers in the field of space biology and medicine today. Emphasis is placed on Orbeli's proposed plans of research involving active injection of a scientist into the stratosphere (the cosmic space of present time); studies of the interaction of afferent systems; and studies of the effects of cosmic radiation on man. D.S.G.

N65-13727* National Aeronautics and Space Administration, Washington, D.C.

SOME PHYSIOLOGICAL ASPECTS OF THE SYSTEM OF ASTRONAUT SELECTION AND TRAINING

A. V. Lebedinskiy, N. I. Arlashchenko, B. B. Bokhov, Yu. G. Grigor'yev, L. N. Kvasnikova et al *In its Aviation and Space Med.* Dec. 1964 p 284-289 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Because knowledge of the functional condition of the vestibular analyzer of body position and movement is important in the selection of astronauts, studies of the vestibular analyzer and its interactions were undertaken to (1) determine the threshold sensitivity of the semicircular canals to both positive and negative acceleration, (2) determine the functional state of the semicircular canals from analysis of reactions to deceleration following accelerations of various duration and magnitude, and to establish distinct vegetative reactions, (3) evaluate individual differences in the degree of vestibular adaptation to angular acceleration, and (4) test individual response to Coriolis acceleration. Studies indicating that retinal stimulation has an inhibiting effect on the vestibular analyzer and that the magnitude of the effect is determined by the degree of excitation of the vestibular analyzer are also reported. M.P.G.

N65-13728* National Aeronautics and Space Administration, Washington, D.C.

THE PROLONGED EFFECT OF SLOW CORIOLIS ACCELERATIONS ON THE HUMAN ORGANISM

A. V. Lebedinskiy, N. I. Arlashchenko, V. Ye. Busygin, R. A. Vartbaronov, A. S. Veselov, et al *In its Aviation and Space Med.* Dec. 1964 p 289-292 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Coriolis acceleration effects on humans were studied in a closed chamber rotating at constant angular speeds of 5.3°, 10.6°, and 21.2° per sec for periods up to 24 hours. Test subjects were seated in armchairs within the chamber, and the Coriolis acceleration was produced by periodically tilting the body and head in planes perpendicular to the chamber rotation at the rate of one movement per second. Functional changes in the CNS and cardiovascular system, disruptions of thermoregulation and equilibrium functions, and vegetative disorders occurred in direct proportion to increases in rotation speed and duration. After several hours in the chamber, adaptation occurred with alleviation of these disorders in all subjects except those with a very low tolerance to vestibular stimulation. Such lengthy, slow rotation is recommended as an astronaut training procedure. M.P.G.

N65-13729 National Aeronautics and Space Administration, Washington, D.C.

LABOR HYGIENE AND OCCUPATIONAL PATHOLOGY INVOLVED IN THE WORK WITH CENTIMETER WAVE GENERATORS IN THE CIVIL AIR FLEET

A. Ya. Loshak *In its Aviation and Space Med.* Dec. 1964 p 292-295 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The causes of uhf irradiation of the engineering and technical personnel of a radar station are assessed, and the factors influencing the amount of radiation received by such personnel are considered, including the length of the working day, the height and angle of elevation of the antennas, and the wavelengths at which the station is operating. The symptoms associated with uhf radiation are discussed briefly, and a number of procedures are proposed to shield radar station personnel from the uhf field. M.P.G.

N65-13730* National Aeronautics and Space Administration, Washington, D.C.

THE VIBRATION AND RADIATION EFFECT ON THE ACIDIFYING PROCESSES IN THE BRAIN TISSUES OF RATS

L. D. Luk'yanova *In its Aviation and Space Med.* Dec. 1964 p 296-297 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The partial oxygen pressure or tension (pO₂) in various sections of the brain was measured by the oxygen cathode method of polarographic analysis. Vertical vibration produced an immediate sharp increase in the consumption of oxygen, followed by reduced consumption lasting 2 hours, followed by normalization of the process. In animals subjected to repeated vibrations, the brain consumption of oxygen during the vibration increased faster and diminished more slowly. The changes in consumption rates were most conspicuous in the motor region of the cerebral cortex. Irradiated animals revealed a decreased oxygen consumption immediately after their exposure, but such consumption was back to normal 1 to 2 days later. Animals subjected to vibration followed by irradiation revealed a predominance of the vibration effect. R.L.K.

N65-13731* National Aeronautics and Space Administration, Washington, D.C.

AN ELECTROENCEPHALOGRAM OF AN ACUTE HYPOXIC (sic) HYPOXIA

V. B. Malkin *In its Aviation and Space Med.* Dec. 1964 p 297-301 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In order to determine the diagnostic significance of the various electroencephalographic changes, the clinical picture of developing hypoxia was correlated with the EEG changes. The clinical picture included electrocardiograms, recording of respiratory movements, arterial blood pressure, and determination of the oxygen saturation of the arterial blood. An accompanying psychophysiological examination included a study of the rate of simple conditioned motor reactions, the recording of a memorized test, the solution of simple arithmetic problems, and a recording of the general subjective feeling. Results established that the initial symptoms of disrupted CNS activity in moderate hypoxia can occur while the EEG remains within the norm. The type and sequence of EEG changes produced by the development of acute hypoxia-connected disturbances of the CNS are described in detail. R.L.K.

N65-13732* National Aeronautics and Space Administration, Washington, D.C.

THE CHARACTERISTIC FEATURES OF THE CLINICAL COURSE AND THE EXPERT'S OPINION OF FLIGHT PERSONNEL AFFLICTED WITH STOMACH AND DUODENAL DISEASES

Ye. T. Malyshkin and B. L. Gel'man *In its Aviation and Space Med.* Dec. 1964 p 301-303 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A study of all data obtained from case histories of 310 persons, 124 of whom suffered from ulcers and 186 from chronic gastritis, as well as examination data on 88 ulcer patients and 101 chronic gastritis patients, failed to reveal any obvious direct connection between the diseases and the effect of specific factors characteristic of the flying profession, or of the intensity and duration of flying. Examination of the secretory activity of the stomach glands on a number of these patients revealed a continuing high level of acidity and secretion, which is explained by the intensified regeneration and hyperplasia of the glandular apparatus. A study of the characteristic features of the higher nervous system by the method of conditioned reflexes revealed pronounced differences in the cortical processes; the greatest disruptions were found in people suffering from chronic gastritis and ulcers in an aggravated stage, while those in the remission stage had established a partial or complete normalization of the cortical processes. D.S.G.

N65-13733* National Aeronautics and Space Administration, Washington, D.C.

ON THE DIAGNOSIS AND EXPERT MEDICAL OPINION OF FLIGHT PERSONNEL AFFLICTED WITH ATHEROSCLEROSIS
Ye. T. Malyshkin, N. A. Gol'din, and V. M. Tolstov *In its Aviation and Space Med.* Dec. 1964 p 303-305 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Several complex clinico-physiological instruments and laboratory procedures for diagnosis of early stages of atherosclerosis were studied to establish criteria in the selection of flying personnel. The diagnostic complex included: (1) determination of metabolic changes by examining the protein fractions of blood serum, cholesterol and its fractions, the lecithin-cholesterol index, the lipoproteins, thyroid gland functions, basal metabolism, and penetrability of the vessels; (2) electrocardiogram, ballistocardiogram, and vectorcardiogram examinations; and (3) determination of propagation rate of the pulse wave, piezography, and rheovasography from the lower extremities. Conclusions relating to the acceptance of flight personnel showing latent arterosclerosis are presented. D.S.G.

N65-13734* National Aeronautics and Space Administration, Washington, D.C.

VESTIBULAR REACTIONS UNDER THE EFFECT OF VARIOUS ANGULAR ACCELERATIONS

S. S. Markaryan *In its Aviation and Space Med.* Dec. 1964 p 305-308 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The effect of angular accelerations on 13 normal subjects at various body tilts was studied, and the following conclusions were drawn: (1) The duration and intensity of the nystagmic reaction produced by the effect of angular accelerations on man depend on the position of the body in relation to the vertical rotation axis; the nystagmus gradually diminishes with the increasing angle of body inclination (from 0 to 90°), while the sensory reaction continues in the form of a counterrotation illusion. (2) In the first 30 minutes or more of the nystagmic reaction it is impossible to read the aerial navigation instruments or the signs on the choline table. (3) An upset body equilibrium in various degrees is found in the majority of the test subjects. (4) Changing the position of the head during or after the rotation produces vestibulo-vegetative reactions in persons with a higher vestibular sensitivity. (5) The use of repeated effects of angular accelerations may be recommended for the purpose of training flight personnel in use of the vestibular analyzer. Author

N65-13735* National Aeronautics and Space Administration, Washington, D.C.

REACTIVE CHANGES IN THE INGUINAL LYMPH NODES UNDER THE EFFECT OF VARIOUS OVERLOADS ON THE ORGANISM OF DOGS

Yu. V. Mashkovtsev *In its Aviation and Space Med.* Dec. 1964 p 309-312 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A study of the effect of G-forces on the inguinal lymph nodes was carried out with dogs subjected to transverse (chest-back) accelerations of varying magnitude and duration. There were two series of tests: 3 minutes under an 8-G load factor, and 1 minute under a 12-G load factor. The tests involved 28 mongrel dogs, all of which had been immunized against the plague 2 weeks before the tests. The animals were sacrificed 1 hour, 24 hours, 3, 7, 15, 30, or 60 days after the G-force effect. The lymph nodes were removed, sectioned, and stained, and the areas of centers of hemopoietic activity and the number of mytoses were measured. It was found that the load factors in the first series of tests produced a more powerful effect on the lymphopoietic tissue than the shorter but heavier loads of the second series, and that the destruction of the lymphoid follicles in the first days after the G-force was eventually followed by a regenerative phase. D.S.G.

N65-13736* National Aeronautics and Space Administration, Washington, D.C.

THE DYNAMICS OF THE MORPHOLOGICAL CHANGES IN THE CEREBRAL CORTEX OF DOGS FOLLOWING THE EFFECT OF A TRANSVERSE ACCELERATION

D. I. Medvedev *In its Aviation and Space Med.* Dec. 1964 p 312-315 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Two series of tests were made: in the first, the animals were subjected to a single, transverse 8-g acceleration for 3 minutes, and in the second, to 12-g for 1 minute. One hour, or 1, 3, 7, 15, 30, or 60 days later the dogs were killed and brain samples were taken for microscopic investigations. As an effect of acceleration a larger number of morphohistochemical changes took place in the area of the motor analyzer of the dog's cerebral cortex. Some of the changes (the hemorrhages, for example) were undoubtedly induced by the accelerations, while others reflect the compensatory reactions of the nerve tissue. A few instances of nerve-cell death and an increased number of binuclear cells were examples of definite reactive changes, but the overwhelming majority of changes were of a reversible nature. The changes occurring in the first series of tests were more pronounced but of the same nature as those in the second series. D.S.G.

N65-13737* National Aeronautics and Space Administration, Washington, D.C.

THE EFFECT OF A PROLONGED HYPOKINESIA ON THE HUMAN BLOOD CIRCULATION

A. L. Myasnikov, R. M. Akhrem-Akhremovich, L. I. Kakurin, Yu. T. Pushkar, N. M. Mukharlyamov et al *In its Aviation and Space Med.* Dec. 1964 p 316-318 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A regimen of confinement to bed was used as a method approaching certain hypodynamic and circulatory effects of weightlessness. The test subjects were four men, 22 to 24 years of age, judged to be in perfect health. These men were kept in a horizontal position for 20 days, and allowed to sit up in a spacecraft once every 3 to 4 days. Clinical and physiological tests

were made before the experiment, during confinement to bed, after the confinement, and after knee-bend exercises. Details of the examinations are presented. It is assumed that a similar tendency of functional changes of the cardiovascular system will occur in a person returning to terrestrial gravitation after a long period of weightlessness. D.S.G.

N65-13738* National Aeronautics and Space Administration, Washington, D.C.

SOME PROBLEMS OF PROFESSIONAL SELECTION

V. D. Nebylitsyn and B. M. Teplov *In its Aviation and Space Med.* Dec. 1964 p 318-321 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

For efficient and effective selection of people for specific activities, it is necessary to predict two basic characteristics of the individual: first, his educational progress or his capacity for learning; and second, his efficient behavior under any complex situation including extreme conditions, i.e., his operational effectiveness. In order to determine the first characteristic, it is proposed that the individual's capacity for acquiring new habits and knowledge be measured rather than the habits he already possesses. The second quality is closely associated with the individual's neurophysiological characteristics; proposed measurements include emotional balance, self control, a sense of timing, capacity for concentration, psychic endurance, reorientation, etc. The significance of each characteristic is discussed. D.S.G.

N65-13739* National Aeronautics and Space Administration, Washington, D.C.

THE SANITARY ASPECT OF THE WORKING CONDITIONS AROUND ULTRAHIGH FREQUENCY GENERATORS

M. I. Netebeba *In its Aviation and Space Med.* Dec. 1964 p 321-324 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Because of numerous complaints about health by service personnel in radar stations, medical examinations were given to all personnel subjected to uhf radiation, and a study of the working conditions at those installations was instituted. It was found that the maximum uhf radiation around dispatchers was 0 to 10 microwatt/cm², but that radio technicians tuning and adjusting antenna devices received 60 to 600 microwatt/cm². Clinical studies of 10 radio technicians and shift engineers on a longer workday revealed very pronounced functional changes (asthenic and vegetative reactions) in their various organs and systems. Changes in the peripheral blood composition were found in 14 engineers and radio technicians; pronounced changes in the organon visus were found in one case. Organic changes were not found in the cardiovascular and nervous systems of those investigated. Recommendations are made for protective measures. D.S.G.

N65-13740* National Aeronautics and Space Administration, Washington, D.C.

THE ROLE OF THE SINOCAROTID REFLEXOGENIC ZONE IN THE REACTION OF THE BLOOD SYSTEM TO REDUCED BAROMETRIC PRESSURE

Yu. V. Nikolayenkov *In its Aviation and Space Med.* Dec. 1964 p 324-327 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The changes in the peripheral blood and bone marrow of 14 adult male dogs subjected to alternating low barometric pressures in a series of "ascents" in a pressure chamber were investigated. The results of the tests indicate that the sino-carotid reflexogenic zone is an important link between the reaction of the blood system to the reduced pressure and the related oxygen starvation of the organism. The exclusion of the

reflex impulse from the interoceptive zone of the carotid sinuses results in a disruption of the usual reaction of the blood system to hypoxia. It also disrupts the processes of blood formation, distribution, and destruction. D.S.G.

N65-13741* National Aeronautics and Space Administration, Washington, D.C.

EVALUATING SOME OF THE ORGANISM'S REFLEX REACTIONS TO BREATHING UNDER INCREASED INTRAPULMONARY PRESSURE

P. V. Oblapenko *In its Aviation and Space Med.* Dec. 1964 p 328-330 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Breathing under increased intrapulmonary pressure produces reflex reactions to restore normal blood circulation; however, these reflexes are not always compatible and, far from eliminating the hemodynamic disruptions, they may intensify them and lose their adaptive function. Foremost among the reflexes are those that raise the tonus of the peripheral vessels and accelerate the cardiac rhythm; at the same time, other reflexes produce a bradycardia and dilatation of the peripheral vessels. In the initial period of experiments with dogs, the beat volume of the left heart was sharply reduced and tachycardia resulted. Eventually, compensatory reactions began which resulted in decreased output of the heart and reduced arterial pressure. The mechanisms of this reaction of a slower cardiac rhythm occurring under the effect of the parasympathetic nervous system are discussed. D.S.G.

N65-13742* National Aeronautics and Space Administration, Washington, D.C.

STUDYING THE NYCTOHEMERAL RHYTHM OF FUNCTIONS IN CONDITIONS OF LIMITED MOBILITY

N. Ye. Panferova *In its Aviation and Space Med.* Dec. 1964 p 330-333 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The effects of maximum possible limitation of muscular work and body movement on the nycthemeral rhythm of body temperature, pulse frequency, respiration, and blood pressure were investigated. Two series of experiments were conducted using test subjects kept flat on their backs in special armchairs for 2 to 10 days during the first series, and in a lying position in water for 1.5 to 11.5 days during the second. Measurements were taken every two hours. Results indicate that changes occur in the nycthemeral rhythm of the studied functions, particularly body temperature, and that the changes are more pronounced when the test subjects are kept in water. It is concluded that vigorous muscular activity is an important requirement for maintaining the daily functional patterns developed during the course of evolution. D.S.G.

N65-13743* National Aeronautics and Space Administration, Washington, D.C.

SOME STRUCTURAL PRINCIPLES OF FLIGHT CONTROL AND NAVIGATION SYSTEMS

Yu. A. Petrov *In its Aviation and Space Med.* Dec. 1964 p 333-335 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The design of instrument displays for aircraft equipped with automatic and semiautomatic control systems is discussed. To prevent overtaxing the pilot's attention with secondary information, the display should indicate only the emergency features of engine operation that require correction by the pilot. The pilot should be free to concentrate mainly on the location and position of the aircraft, the implementation of the preset flight program, the actual flying conditions in comparison with the prescribed ones, and the performance of apparatus installed in the aircraft. On this basis, the indicators on the display

panel are classified as either information indicators, which extend the functions usually perceived by the sense organs, or command indicators, which alert the pilot to his next move. The choice of the type of display (signal lights, needle gages, command inscriptions, etc.) for these two types of indicators is discussed briefly. M.P.G.

N65-13744* National Aeronautics and Space Administration, Washington, D.C.

PATHOMORPHOLOGICAL CHANGES INDUCED IN ANIMALS BY ROTATING THEM AROUND AXES RUNNING THROUGH THE PELVIC-CARDIAC-CEPHALIC REGION
V. G. Petrukhin *In its Aviation and Space Med.* Dec. 1964 p 336-339 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Autopsies of dogs subjected to lengthy radial acceleration revealed that, regardless of the location of the rotation axis (pelvic, cardiac, or cephalic region) and body tilt angle, considerable changes are produced by overloads exceeding 2.5 g and lasting 20 minutes. Sixfold overloads cause death in almost all cases. The main reasons for the acceleration injuries are apparently the sharp increase in the venous pressure and severe displacement of the organs. The venous pressure increase is caused by blood stasis in the extremities and arterio-venous anastomoses in the lungs, which in turn causes hypoxia of the myocardium and brain, edema, and hemorrhages and necrobiotic changes in all the organs. M.P.G.

N65-13745* National Aeronautics and Space Administration, Washington, D.C.

THE PATHOMORPHOLOGY OF TRANSVERSE OVERLOADS
V. G. Petrukhin and M. M. Sokolova *In its Aviation and Space Med.* Dec. 1964 p 339-342 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Pathomorphological changes in animals subjected to the following transverse accelerations in the chest-back position are described: 8 g for 3 min; 12 g for 1 min; 12 g for 3 min; and 12 g for 3 to 5 min. The nature of the changes observed was identical in all test series, but the second and third series revealed more extensive lesions. Animals sacrificed less than an hour after acceleration showed pooling of blood in the right heart cavities, vena cava, pulmonary arteries, liver, and lungs. Only the lung lesions were macroscopically evident after 8 days. Brain, heart muscle, liver, kidney, and adrenal gland changes are also discussed, the majority were found to be reversible. The effects of acceleration on the brain and myocardium resemble the changes produced by hypoxia. This is considered as further evidence that the effects of transverse acceleration are associated primarily with disruption of blood circulation in the entire organism. M.P.G.

N65-13746* National Aeronautics and Space Administration, Washington, D.C.

SOME PROBLEMS OF THE HUMAN PERSONALITY IN AERONAUTICS, AVIATION AND ASTRONAUTICS
K. K. Platonov *In its Aviation and Space Med.* Dec. 1964 p 342-346 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Personality and its role in flight is discussed historically and philosophically from the first balloon flights, in which man was relatively inactive, to the complexity of present day flight. Early in the history of flight, two distinct approaches to the study of the psyche of a flier became evident—the personal and the functional, both of which are combined

with the mechanistic approach. During the 1920's, a swing to a biological or "reflexological" view of the pilot occurred as a result of previous overemphasis on psychotechnical investigations. Two more biological trends occurred as the result of misinterpretations of resolutions adopted at party conferences in 1936 and 1950. As a result, aviation psychology has suffered, and the need still remains for a theory of personality and individual talent in the art of flying. M.P.G.

N65-13747* National Aeronautics and Space Administration, Washington, D.C.

EVALUATING THE EFFECTIVENESS OF THE EXPERIMENTAL METHODS USED IN THE PSYCHOLOGICAL SELECTION OF AVIATION CADETS

B. L. Pokrovskiy, T. I. Zhukova, and V. P. Zukhar' *In its Aviation and Space Med.* Dec. 1964 p 347-349 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The predictability and reliability of methods used to reveal individual psychological characteristics of personality important for the flying profession were investigated. The ratings given the cadets in the prescribed tests were compared with ratings of their actual flying performances. Considerable differences in the correlation ratios were found, varying from high predictability for such tests as addition, switch manipulation, and correction-making to negative predictability for the scales-estimating test. Reliability of the test methods was determined by repeating the investigation on a second group of cadets a year later. Although the results of the entire complex of methods correlated with the quality of flying progress with a 99% probability, the probable correlation based on individual methods was always less than 95%. M.P.G.

N65-13748* National Aeronautics and Space Administration, Washington, D.C.

SOME REASONS FOR ERRORS MADE BY THE PILOTS IN INSTRUMENT FLYING

V. A. Ponomarenko and A. G. Shishov *In its Aviation and Space Med.* Dec. 1964 p 349-352 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A study of over 50 cases of flying and navigation instrument failure shows that proper action by the pilot is frequently preceded by erroneous action. The erroneous action is shown to be due to a cause-and-effect chain of inertia in the signal system, delay in indicating the failure, psychological conflict between the incoming information and the pilot's perception, and prolonged mental and visual search for the reason for the contradictory information. Physical dissimilarities among the types of indicators further increase the probability of erroneous action. Possible indicators that would immediately alert the pilot to the fact that the failure is in the instrument and not in the aircraft parameter being measured are discussed. These include a tape with black and white stripes, whose motion is easily perceived by peripheral vision, and a sound signal system for emergency landing after instrument failure. M.P.G.

N65-13749* National Aeronautics and Space Administration, Washington, D.C.

SOME METHODS OF IMPROVING THE PERCEPTION OF PARAMETERS CONTROLLED BY A HUMAN OPERATOR

V. A. Popov, A. M. Pikovskiy, Yu. V. Kiselev, and Yu. V. Krylov *In its Aviation and Space Med.* Dec. 1964 p 352-355 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The possible advantages of equipping flight instruments with auxiliary sound indicators is investigated. In such a system both the visual display and the tonal frequency should change

continuously as the parameter being measured changes. Tests to measure human operator response to the dual indicator system show that combined visual and auditory indication improves the perception of the parameter by 6% to 11% as compared to either visual or auditory indication alone. In certain subjects the improvement amounted to 35% to 55%. The design of a dual indication system should be based on the fact that the differential audiofrequency threshold is not less than 0.02 of the frequency under investigation under conditions of background cabin noise. M.P.G.

N65-13750* National Aeronautics and Space Administration, Washington, D.C.

THE REACTION OF THE ORGANISM TO THE INFORMATIONAL CHARACTERISTIC OF A STIMULUS

V. A. Popov and A. S. Khachatur'yants *In its Aviation and Space Med.* Dec. 1964 p 355-358 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The effect of specific factors on reactions to a variety of stimulus probabilities was studied. A definite logarithmic relationship was found between the length of time the informational significance of the signals was remembered and the magnitude of that significance. There was a progressive reduction in the hidden time of reaction to each signal of the informational complex. In a series of tests of the effects of deleterious factors—prolonged acoustical noise, alcohol, oxygen deficiency, barometric pressure drops, prolonged unchangeable position, etc.—a common factor was a shorter retention period for the informational significance of the signals, but the nature of the memory loss was specific to each factor. R.L.K.

N65-13751* National Aeronautics and Space Administration, Washington, D.C.

ELECTROCARDIOGRAMS IN DOGS DURING EXPOSURE TO CERTAIN ALTITUDE FACTORS

V. L. Popkov and I. N. Chernyakov *In its Aviation and Space Med.* Dec. 1964 p 358-362 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

A series of EKG's were taken on 11 dogs subjected (1) to hypoxic hypoxia in a pressure chamber atmosphere with an oxygen deficiency equivalent to an altitude of 9 km, (2) to the effect of respiration of high-pressure sea level and high-altitude atmospheres, and (3) to the effect of a pressure reduction of 0.3 abs atm. The consistent nature of the EKG changes after reduction in ambient pressure, as well as the differences between the EKG's of dogs exposed to excess pressure and those of dogs exposed to hypoxia, indicated that the factors determining these EKG changes were the delivery of excess pressure in barochambers and the resultant alteration in the position of the heart within the chest cavity. It was concluded that the changes in dog EKG's accompanying the respiration of excess pressure atmospheres were the result of physiological adaptation of the organism to its environment and did not exceed the limits of normal EKG variations in dogs. R.L.K.

N65-13752* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF OXYGEN STARVATION ON MOTION SICKNESS

N. A. Razsolov *In its Aviation and Space Med.* Dec. 1964 p 362-365 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Five subjects were tested for physiological reactions, dynamometric performance, and correction task performance after control tests and after being subjected to rocking under oxygen-starvation conditions. Conclusions are: (1) Rocking by the

method of two-fold rotation makes it possible to elicit a latent illusion of rocking in statokinetically stable people and a marked illusion of rocking in less stable persons. (2) During rocking under conditions of oxygen starvation, vegetative reactions are intensified. (3) During both forms of rocking, higher nervous activities are disrupted, apparently at the expense of weakened inner cortex inhibition, causing a poorer quality performance in the correction test and rationed manual dynamometry. (4) Oxygen starvation at 4000-m height apparently results in weakening of the inner inhibition, which is reflected in poor performance of the correction tests. (5) During rocking under conditions of oxygen starvation, a still greater cumulative disturbance of higher nervous activity is observed. R.L.K.

N65-13753* National Aeronautics and Space Administration, Washington, D.C.

THE IMPORTANCE OF THE STUDY OF TYPES OF HIGHER NERVOUS ACTIVITY IN MAN IN SELECTING AND TRAINING FLIGHT PERSONNEL

A. A. Rogov, T. T. Gorlanova, M. M. Kantorovich, and N. T. Kovaleva *In its Aviation and Space Med.* Dec. 1964 p 366-368 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Vascular reactions to nonconditioned and conditioned stimulation were studied using subjects exemplifying Pavlov's nervous system types. Background plethysmograms furnished preliminary data for evaluating the chief characteristics of the nervous system. The pattern for the well-balanced mobile type of nervous system, the ideal type for astronauts, includes pronounced nonconditioned vascular reflexes which are characterized by a considerable drop in plethysmogram. Conditioned vascular reflexes in individuals with this sanguine type of nervous system are distinguished by rapid formation and quick stability, with little change in magnitude after formation. As a rule they appear against a background of smooth plethysmograms. Differentiated inhibition is developed comparatively rapidly with 7 to 8 applications of negative inhibition, and the reflexes become stable after 42 applications of stimulations without reinforcement. The conditioned reflexes of phlegmatic, choleric, and melancholic individuals are also described. R.L.K.

N65-13754* National Aeronautics and Space Administration, Washington, D.C.

SOME REGULAR PATTERNS IN THE EFFECT OF ACCELERATION ON THE ORGANISM

D. Ye. Rozenblyum *In its Aviation and Space Med.* Dec. 1964 p 368-369 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Two basic phases are distinguished in the effects of radial accelerations—the relative compensation phase, and the decompensation phase. In the first, some functions, mostly the vital ones, are intensified, and others temporarily inhibited by way of compensation; thus, the mechanical forces exceed the thresholds of individual stability. This phase is neither perfect nor stable. Since the field of centripetal acceleration is equivalent to the acceleration of earth gravitation, the author concludes that the physiological systems of adaptation to earth gravitation carry the load of the fight against increased gravitation. Study of the decompensation phase permits delineation, in the chain of mutually connected phenomena, of some leading links which normally limit transference of accelerations. R.L.K.

N65-13755* National Aeronautics and Space Administration, Washington, D.C.

THE NERVOUS SYSTEM'S ROLE IN THE ORGANISM'S REACTIONS TO ACCELERATIONS

B. M. Savin *In its Aviation and Space Med.* Dec. 1964 p 370-372 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Disturbances of hemodynamics are prominent indications of changed physiological functioning under increase of artificial gravitation. In these disturbances, the neural reflex reactions are most important. In some cases these reactions are compensatory and promote the equilibrium of the organism under the changed mechanical conditions. In other cases they may facilitate the appearance of even more marked hemodynamic disturbances. These differences in the reflex mechanisms of circulatory regulation are based on shifts in CNS functional state, primarily the condition of the vasculomotor center and the vagus nerve centers. Functional disturbances of the reflex mechanism that regulate the cardiovascular system decrease the organism's capacity for adaptation. In the systematic effect of overloads, the organism's capacity to balance the changed conditions of gravitation increases sharply.

R.L.K.

N65-13756* National Aeronautics and Space Administration, Washington, D.C.

ELECTROENCEPHALOGRAPHIC EXAMINATION OF FLIGHT PERSONNEL DURING LONG FLIGHTS

L. V. Sadovnikova *In its Aviation and Space Med.* Dec. 1964 p 372-373 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Analysis of EEG data showed that after 8- to 9-hour flights, flight personnel fully preserved the expression, quantity, and periodicity of the α rhythm. There was a simultaneous drop in voltage of the amplitude of biopotentials (α , β , and others). Lengthened were such EEG indices as depression and latent and restoration periods of the α rhythm after exposure of the eyes to light. The EEG taken after the flight showed no essential changes in the expression of slow waves. Analysis of changes in brain biopotentials led to the conclusion that there is a decreased bioelectrical activity of the cerebral cortex and a decrease in neural mobility with accompanying inhibitory processes. These changes are considered a result of CNS fatigue. Dependence of the aforementioned changes upon fatigue was proved by the time (1.5 to 3 days) required to restore EEG components during rest. Standardized afterflight rest periods were recommended.

R.L.K.

N65-13757* National Aeronautics and Space Administration, Washington, D.C.

FUNCTIONAL STATE OF THE VESTIBULAR ANALYZER DURING THE FIRST FEW HOURS FOLLOWING IRRADIATION WITH DIFFERENT DOSES

A. V. Sevan'kayev *In its Aviation and Space Med.* Dec. 1964 p 373-375 ref (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Experiments were done on 120 rabbits with a setup permitting stimulation of the labyrinth, a wide range of angle accelerations and velocities, and objective registration of nystagmus and frequency of respiration and pulse. Before, immediately after, and 2 and 5 hours after, total irradiation of 50, 100, 500, 800, or 5000 r, the threshold sensitivity and reactivity of the vestibular analyzer were tested. The higher doses resulted in the greater loss of analyzer function. However, at the lower doses (50 and 100r), some animals showed an increased response to stimulation. For the most part, the maximum loss was observed 2 hours after irradiation. Five hours afterwards there was some restoration of the initial response, varying by dose.

R.L.K.

N65-13758* National Aeronautics and Space Administration, Washington, D.C.

HISTOCHEMICAL EXAMINATION OF THE CHANGES IN THE DISTRIBUTION OF THE EFFECT OF DEHYDROGENASE SUCCINATE, CARBOANHYDRASE, ALKALINE AND ACID PHOSPHOMONOEESTERASE, ADENOSINE TRIPHOSPHATASE AND SULFHYDRYL GROUPS OF PROTEINS IN INNER ORGANS IN ACUTE STATE OF OXYGEN STARVATION

S. N. Sergeyev *In its Aviation and Space Med.* Dec. 1964 p 376-379 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Changes in the activity of enzymes due to hypoxia were investigated by comparing simultaneously prepared sections from identical organs in experimental and control animals. The changes observed included relative inhibition of intensification of the activity, or sometimes both decreased and increased activity in different portions of the same organ. These reactions to the disruption of the oxygen supply were extremely rapid, developing much earlier than changes in the sulfhydryl groups of proteins.

R.L.K.

N65-13759* National Aeronautics and Space Administration, Washington, D.C.

CONTEMPORARY PROBLEMS IN AVIATION PHYSIOLOGY

N. P. Sergeyev, V. A. Sergeyev, and F. P. Kosmolinskiy *In its Aviation and Space Med.* Dec. 1964 p 379-384 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The nervous and emotional tension of flying has been shown to induce such physiological responses as shifts in the vegetative vascular reactions and in the mechanism of neuroendocrinal regulation, atherosclerosis, hypertonia, obesity, cardiovascular pathology, cholestrinemia, increased production of steroid hormones, and elimination of ascorbic acid. Because the increasingly complex equipment which the pilot must constantly monitor has overloaded the central nervous system and analyzers, particularly the visual analyzer, the work of the pilot is at the edge of the nervous system's physiological limits. Also unfavorable are the dynamic factors of flight and its unusual hygienic conditions. Aviation physiology must organize research to increase the flier's resistance to the damaging effects of flying, using engineering, psychological, and physiological means. Training, scheduling, special equipment, and new nutritional products are among the methods mentioned to meet the severe conditions of flight.

R.L.K.

N65-13760* National Aeronautics and Space Administration, Washington, D.C.

THE ROLE OF REDUCED REACTIVITY OF THE ORGANISM IN RESISTANCE TO EXTREME INFLUENCES (ACCELERATION, RADIATION)

N. N. Sirotnin *In its Aviation and Space Med.* Dec. 1964 p 384-386 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Investigations of reactivity reduction due to various causes show that animals best tolerate acceleration during deep winter hibernation. Deep hypothermia is next most effective, followed by narcosis. Deep winter hibernation increases radiation resistance more than does hypothermia.

R.L.K.

N65-13761* National Aeronautics and Space Administration, Washington, D.C.

SOME NEW INDEXES OF HEMODYNAMICS, OBTAINED BY MEANS OF THE MECHANOCARDIOGRAPHIC METHOD

M. N. Syvritkin *In its Aviation and Space Med.* Dec. 1964 p 386-387 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The mechanocardiographic method permits evaluation of the volume speed of blood outflow from the left ventricle into the aorta and of the power of contractions of the left ventricle. Simultaneous registration of tachy-oscillograms and sphygmograms permits determination of such hemodynamic indices as arterial pressure, systolic and minute volume of circulating blood, time of expulsion, speed of propagation of pulse wave along the vessels, and peripheral resistance. From the value of the systolic volume (CV in cm^3) and the expulsion time (t in seconds), the volume speed of blood expulsion in the aorta can be calculated. The VSO represents the quotient from the division of CV by t: $\text{VSO} = \text{CV}/t \text{ cm}^3/\text{sec}$. The rate of the values of VSO and average hemodynamic pressure (My) permits calculation of the strength of the contractions of the left ventricle (P) as follows: $P = A/t = \text{CV}/t \cdot \text{My} = \text{VSO} \cdot \text{My}$ watt, where A is work performed during a unit of time. Average rates for these items in 300 healthy individuals were $P = 2.64$ to 2.65 watts and $\text{VSO} = 253 \text{ cm}^3/\text{sec}$. In patients with neurocirculatory dystonia of the hypertensive type, the two indices were higher. R.L.K.

N65-13762* National Aeronautics and Space Administration, Washington, D.C.

METABOLIC CHANGES UNDER THE EFFECT OF PARACHUTE JUMPING

Yu. K. Syzrantsev, Yu. F. Udalov, and N. A. Chelnokova *In its Aviation and Space Med.* Dec. 1964 p 387-390 (See N64-13626 04-04) OTS: HC \$7.63/MF \$2.25

Urea elimination on parachute jumping days did not increase, so it was assumed that increased decomposition of nucleic acid did not take place. However, the blood nucleic acid content dropped to 280 mg percent as compared with 360 mg percent on control days. The changes in protein metabolism during jump training were similar to those shown under conditions of prolonged flight. The indices of vitamin metabolism dropped, indicating not only an increased vitamin requirement but also a marked emotional tension on jumping days. The greatest changes were found in vitamin B₁ metabolism, the vitamin which participates directly in transmittal of nervous stimulation, and in nicotinic acid exchange, which is closely associated with CNS function. Increased blood cholesterol was observed not only on the day of jumping but also on the following day; this, especially against a background of altered vascular tonus, is considered a forerunner of atherosclerosis. R.L.K.

N65-13763* National Aeronautics and Space Administration, Washington, D.C.

VITAMINS IN THE DIET OF AVIATORS AND ASTRONAUTS

Yu. F. Udalov *In its Aviation and Space Med.* Dec. 1964 p 390-393 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Examination of a large number of flight personnel contradicts the supposition that vitamin requirements are based mainly on the level of energy expenditure. Vitamin consumption increased during exposure to vibration, prolonged acceleration, increased ambient temperature, weightlessness, high altitudes, extreme climates, and during testing of emergency lifesaving gear, and also in test pilots compared to regular pilots—in short, during any state of physiological stress. Vitamin-enriched diets for flying personnel not only prevent deficiencies but increase the body's resistance to unfavorable environmental factors, infections, etc., and result in increased

work capacity and reduction of fatigue. It also has a normalizing effect on several metabolic indices affected by flight, especially the lipid metabolism and the cholesterol blood levels. R.L.K.

N65-13764* National Aeronautics and Space Administration, Washington, D.C.

CHANGES IN EXCITABILITY AND LABILITY OF THE VISUAL ANALYZER UNDER CONDITIONS OF PROLONGED NONSTOP FLIGHTS IN MULTIPASSENGER TURBOPROP PLANES

A. I. Ustinova *In its Aviation and Space Med.* Dec. 1964 p 393-395 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Flight crews were tested during and after 8- to 9-hour flights. During the first 3 to 4 hours of flight most crew members showed increased excitability and lability of the visual analyzer or maintained their takeoff level. In the 8th to 9th hour of flight there were fatigue-caused reductions in these indices in 77% of the cases observed. A 24- to 27-hour post-flight rest period restored the visual analyzer functions to the initial level in the majority of subjects, but the instability of the restoration was shown on the return flight by a less clearly expressed positive phase and a greater degree of deterioration at all stages of the flight. Negative shifts were more pronounced in flight commanders than in other crew members, and on night flights than on daylight flights. R.L.K.

N65-13765* National Aeronautics and Space Administration, Washington, D.C.

SOME METABOLIC INDEXES IN THE ASTRONAUTS YU. A. GAGARIN, G. S. TITOV, A. G. NIKOLAYEV AND P. R. POPOVICH

T. A. Fedorova, L. T. Tutochkina, M. S. Uspenskaya, M. M. Skurikhina, and Ye. A. Fedorov *In its Aviation and Space Med.* Dec. 1964 p 395-398 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Examination of astronauts by a special combination of analyses, before and after flight on spacecraft, provided definite data on biochemical changes occurring under such conditions. Biochemical tests were chosen which show significant deviations from the norm in "stress" states and under the effects of ionizing radiation. The study of several radiation-sensitive biochemical indices was of interest, inasmuch as it may be possible, during future prolonged flights traversing zones of dangerous radioactivity, to differentiate the bodily changes caused by radiation from those caused by other space-flight factors. Author

N65-13766* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF ANGULAR ROTATION VELOCITIES ON THE STATE OF SEVERAL VISUAL FUNCTIONS

A. B. Flekkel' *In its Aviation and Space Med.* Dec. 1964 p 398-400 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Data obtained from rotation of subjects in a sitting position revealed the dependence of the visual functional state on the angular velocity of rotation and the degree of inclination of the subject's trunk from the vertical axis. With increased postural inclination, equivalent effects on the visual functions occurred at correspondingly smaller angular velocities. This was true of the several visual functions tested: visual acuity, critical flicker fusion frequency, and field of vision. During rotation in a supine position, the important determinant was the position of the axis of rotation in relation to the body of the subject. The effect on the visual functions was considerably greater when the axis of rotation passed through the

vicinity of the head and the feet, and smaller when it passed through the vicinity of the heart. Maximum impairment of visual function occurred in the 5th to 6th minutes of rotation, after which the function was gradually restored. Analysis of the results indicates that the amount of change in visual function depends to a considerable degree on the magnitude of acceleration produced in the most distant part of the body.
R.L.K.

N65-13767* National Aeronautics and Space Administration, Washington, D.C.

REACTIVITY OF THE ORGANISM AND METHODS OF INCREASING ITS RESISTANCE TO CERTAIN FLIGHT FACTORS

I. M. Khazen *In its Aviation and Space Med.* Dec. 1964 p 401-406 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Summarized are experimental findings on the resistance of animals to hypoxia, acceleration, rolling motion, explosive decompression, microwaves, and X-rays. Also studied are the characteristics of the adaptation reactions of man to these factors. Correlations between the various functional systems under the influence of a given stimulus were noted and criteria obtained for judging the reactivity of the organism. Particular attention was paid to oxygen deficiency since hypoxic conditions, judged from tissue processes, may also occur after exposure to several other stimuli. Thus, tissue adaptation to hypoxia is of significance in solving problems connected with increasing resistance to acceleration, explosive decompression, radiation, etc. In addition to the general clinico-physiological methods, the neuroglandular apparatus of the digestive system was used as an indicator in studying general homeostatic reactions. In prophylactic intervention, microwaves were used to increase resistance to hypoxia, and physical training was used as a general means of increasing resistance to flight factors.
R.L.K.

N65-13768* National Aeronautics and Space Administration, Washington, D.C.

HISTOPHYSIOLOGICAL CHANGES IN ANIMALS EXPOSED TO ACCELERATIONS

I. M. Khazen, E. M. Kogan, and A. S. Barer *In its Aviation and Space Med.* Dec. 1964 p 406-409 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The effects of repeated exposures to acceleration upon the morphology of organs and tissues was investigated in rats. Histological investigation of tissues obtained from the brain, heart, lungs, liver, and kidneys immediately after acceleration showed a pattern of increase in the morphological changes in various tissues and lungs of animals in relation to the frequency of exposure. A definite relationship was noted between the morphological changes and duration of action after eight exposures to accelerations of lesser intensity but greater duration. In all variations of the experiments, the reaction of the cardiovascular system was most pronounced.
R.L.K.

N65-13769* National Aeronautics and Space Administration, Washington, D.C.

THE EFFECT OF ADEQUATE STIMULATIONS OF THE VESTIBULAR APPARATUS ON THE ELECTRICAL POTENTIAL OF THE STOMACH

V. T. Khlebas and N. P. Kozhukhar' *In its Aviation and Space Med.* Dec. 1964 p 410-413 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Electrogastrography was used to study the digestive function of dogs under conditions of cosmic flight. Strong, prolonged stimulation of the vestibular apparatus caused changes

in the bioelectric potential of the stomach. In the majority of the cases the potential was lowered. An analysis of the results showed that lowering of the stomach potential coincided with the excitation of the gastric glands. Motion-induced sickness was a stronger stimulator of the gastric glands than was rotation. The individual dogs did not exhibit identical secretory-motor reactions of the stomach when the vestibular apparatus was stimulated.
R.L.K.

N65-13770* National Aeronautics and Space Administration, Washington, D.C.

THE STATUS OF ANTICOAGULATING MECHANISMS UNDER CONDITIONS OF PROLONGED HYPOKINESIS

Ye. I. Chazov and V. G. Ananchenko *In its Aviation and Space Med.* Dec. 1964 p 414-415 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

To judge the effect of hypokinesia on anticoagulation capacities of the organism, researchers studied the content of free heparin in the blood, the fibrinolytic activity of the blood, the plasma heparin tolerance, and thromboelasticity. In the first series, studies were carried out before and after a 3-day period under hypokinetic conditions. Three of the four subjects did not show any regularity in changes of state of the thrombus-forming properties of the blood. More regular changes were obtained in the second series of investigations with prolonged hypokinetic states, when four subjects were in a state of prolonged rest for a period of 20 days. It was found that prolonged hypokinesia in healthy persons leads to an increase in the anticoagulating and lytic properties of the blood, which lessens the possibilities for thrombus formation. In the third series, four subjects also remained on a prolonged bedrest regime, but systematically carried out a complex of definite physical exercises. No increase was noticed in the fibrinolytic activity of the blood and in the content of free heparin.
R.L.K.

N65-13771* National Aeronautics and Space Administration, Washington, D.C.

THE EFFICACY OF THE PHARMACOLOGICAL PREPARATION NII IN COMBATING MOTION SICKNESS OF AIR TRANSPORT PASSENGERS

A. V. Chapek *In its Aviation and Space Med.* Dec. 1964 p 416-419 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The therapeutic preparation NII, which contains camphorated scopolamine, hyoscyamine, and nicotinic acid, exhibits a stimulating action on the central nervous system and lowers the excitability of its parasympathetic section. The nicotinic acid, which is part of the tablet, has a positive action on disorders of the internal organs (heart, liver) and on ulcers. It exhibits a vasodilating action (M. D. Mashkovskiy). Side effects of the tablet are dryness in the mouth and reddened countenance. After ingestion, these effects go away automatically. The efficacy of the therapeutic agent, tablet NII, was confirmed under laboratory conditions with experimental motion sickness and in flight. In flight, we carried out two series of experiments: in one experiment, passengers who were subject to motion sickness were given NII tablets; in the other experiment, aeron, which consists of camphorated scopolamine and camphorated hyoscyamine, was given as a control. The NII tablets and aeron were given for prophylaxis and therapy of motion sickness.
Author

N65-13772* National Aeronautics and Space Administration, Washington, D.C.

THE INFLUENCE OF AGE-ASSOCIATED CHANGES IN OLDER PILOTS DURING RE-LEARNING IN THE NEW AVIATION TECHNOLOGY AND DURING PERFORMANCE

A. V. Chapek, V. P. Yerokhin, and I. P. Poleshchuk *In its Aviation and Space Med.* Dec. 1964 p 419-421 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Pilots aged 40 to 50 years were compared with a 30- to 39-year old control group in higher nervous activity, memory, shifting of attention, visual sequential form, cerebral biopotentials, arterial pressure, and in developing skill in estimating short intervals of time. Their flying progress and the quality of their piloting were also evaluated by instructors. The tests did not find a difference between the two groups which could have a negative influence on the process of relearning piloting in gas-turbine airplanes. However, restoration of functions of higher nervous activity after extended flights did proceed more slowly in the older pilots, and in a few older pilots there was some decrease in visual and hearing acuity, although not enough to be considered a negative influence on the quality of flying work. R.L.K.

N65-13773* National Aeronautics and Space Administration, Washington, D.C.

SOME MICROORGANISMS AS INDICATORS OF SOLAR ACTIVITY AND PRECURSORS OF SOLAR FLARES

A. L. Chizhevskiy *In its Aviation and Space Med.* Dec. 1964 p 422-423 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

It appears that nerve cells and certain microorganisms are highly sensitive to solar activity, and, by their reactions, at the atomic-molecular level, signal nuclear processes taking place inside the sun 4 to 5 days earlier than astrophysical instruments indicate any changes in the surface layers of the sun. Study of daily or 10-day curves of epidemic outbreaks showed that, in some instances, sharp peaks in the epidemics forecast astrophysical phenomena. This early warning was quite accurate in the case of mortality from infections and cardiovascular diseases. Similar results were produced in the laboratory. These investigations were carried out in the years between 1915 and World War II. R.L.K.

N65-13774* National Aeronautics and Space Administration, Washington, D.C.

SIGNIFICANCE OF PARASYMPATHETIC NERVOUS SYSTEM TONE IN INCREASING RESISTANCE TO FLIGHT FACTORS

M. D. Chirkin *In its Aviation and Space Med.* Dec. 1964 p 424-427 ref (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The tone of the vagus nerve center was investigated in a comparative physiological manner, with frogs, dogs, and humans as the subjects. The results, supported by others reported in the literature, show that, in general, the higher an animal is on the phylogenetic ladder, and, therefore, the stronger the tone of its vagus nerves, the greater the resistance to unfavorable and unusual environmental agents. Intensified parasympathetic tone also resulted from physical exercises which increased endurance. Correlations between parasympathetic nerve tone and motion sickness are discussed. R.L.K.

N65-13775* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF BRIEF PHYSICAL TRAINING ON THE SURVIVAL OF WHITE RATS KEPT UNDER CONDITIONS OF PROLONGED HYPODYNAMIA AND ISOLATION

V. A. Shkurdoda *In its Aviation and Space Med.* Dec. 1964 p 427-429 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Investigations to determine the specific effect of systematic training on tolerance of hypodynamia and isolation, and to ascertain the degree of resistance to ionizing radiation in rats subjected to various motor regimes are reported. Analysis of the various indexes of motor and autonomic functions indicated that vigorous muscular activity rather than passive rest (transfer of rats from small cages to larger ones) was required to maintain resistance under conditions of hypodynamia and isolation. Physical training probably helped to insure the equilibrium and mobility of the nervous processes, a factor in resistance to hypodynamia and X-irradiation. During hypodynamia, only 6% of the animals given brief training died as compared with 41% of the untrained animals. The rats most resistant to irradiation after hypodynamia were also the animals given brief active training. Two- to three-times more trained animals survived than untrained animals. Passive rest during hypodynamia and isolation improved the survival rate, but lowered the resistance to X-irradiation. R.L.K.

N65-13776* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF PARACHUTE JUMPS ON THE ADAPTIVE REACTIONS IN PERSONS OF DIFFERENT AGE GROUPS

S. N. Shurgin and A. N. Mazin *In its Aviation and Space Med.* Dec. 1964 p 429-431 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

In comparing groups of men under 30 years of age with men 30 and over, emphasis was placed on changes in cardiovascular reactions and blood composition. The functional changes in the older groups, according to the electrocardiographic data, were more pronounced and they tended to persist into the restorative period. The systolic index increased by more than 10%. Sinus arrhythmia and instances of atrial extrasystole were noted after jumps. Investigation of the oculocardiac reflex and orthostatic test provided some information on changes in the tone of the parasympathetic and sympathetic nervous systems. In some of the men under 30, no significant fluctuations were noted in the tone of the parasympathetic nervous system. Sympathetic tone increased markedly during the jump procedure followed by a decrease after landing. In the men over 30, the parasympathetic tone increased, reaching a maximum after landing. There was a subsequent decrease, although normal tone was generally not restored by the second day after landing. The increase in sympathetic tone was less pronounced in this group. Pulse rate and blood effects are given for both groups. R.L.K.

N65-13777* National Aeronautics and Space Administration, Washington, D.C.

PHYSIOLOGICAL REACTIONS IN WEIGHTLESSNESS

Ye. M. Yuganov *In its Aviation and Space Med.* Dec. 1964 p 431-434 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The effect of brief weightlessness on animals and man was examined experimentally to determine the nature and intensity of changes in the vestibular, motor, and tactile analyzers, of impairment of functional interrelations, and of changes in muscle tone and in cardiovascular and respiratory activity. Results indicate that the excitability of the semicircular canals decreases during weightlessness, and the nature of the changes observed indicates that this decrease is due to inhibition of the semicircular canals by impulses from the otoliths, whose influence is much greater during weightlessness. The summation of these stimuli activates the cortical and subcortical regions, producing the symptoms of space sickness. Reflexes from the vestibular analyzers

are also important in changes in muscular tone and venous circulation that may affect human efficiency in weightlessness.

R.L.K.

N65-13778* National Aeronautics and Space Administration, Washington, D.C.

EFFECT OF AIRPLANE NOISE ON MAN AND NOISE CONTROL MEASURES

Ye. M. Yuganov, I. Ya. Borshchevskiy, Yu. V. Krylov, and V. S. Kuznetsov *In its Aviation and Space Med.* Dec. 1964 p 434-436 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Noise can cause fatigue, and hearing, visual, respiratory rate, cardiac activity, and blood pressure impairment. It changes the size of the spleen and kidneys, reduces the number and amplitude of gastric contractions and increases gas exchange. After prolonged exposure to noise, people develop insomnia, timidity, slowing of mental reactions, and inattentiveness. The situation at jet engine test stations is most in need of control. The installation of special sound-absorbing equipment is suggested, as well as the use of individual devices. Work routines should include short rest periods in soundproof places. R.L.K.

N65-13779* National Aeronautics and Space Administration, Washington, D.C.

EFFECTIVENESS OF CERTAIN METHODS OF SELECTING PERSONNEL BY VESTIBULAR TESTS

Ye. M. Yuganov, S. S. Markaryan, I. I. Bryanov, I. A. Sidel'nikov, and R. A. Vartbaronov *In its Aviation and Space Med.* Dec. 1964 p 437-439 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

During flights, two types of vestibular reactions develop which may adversely affect the pilot's efficiency and physical fitness: illusions that make it difficult for the pilot to orient himself, and vestibular-autonomic reactions that cause a deterioration in his general condition. Several methods of vestibular selection are described and discussed. These are aimed at detecting any tendency toward spatial illusions and at determining the thresholds and intensity of vestibular reactions to the simultaneous inhibitory effect of stimuli from two analyzers (motor, visual, etc.). R.L.K.

N65-13780* National Aeronautics and Space Administration, Washington, D.C.

SENSORIMOTOR COORDINATION IN EXTENDED WEIGHTLESSNESS IN ACTUAL SPACE FLIGHT

V. I. Yazdovskiy, I. I. Bryanov, L. I. Kakurin, Yu. V. Krylov, and M. A. Cherepakhin *In its Aviation and Space Med.* Dec. 1964 p 439-441 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

The flight programs of Vostok 3 and Vostok 4 included a study of the effect of extended weightlessness on sensorimotor coordination in astronauts Nikolayev and Popovich. Special tests were conducted in the laboratory, under simulated space-flight conditions, and during the flights themselves to reveal coordination, handling of spacecraft equipment, and handwriting of the astronauts. Weightlessness did not appear to impair sensorimotor coordination. R.L.K.

N65-13781* National Aeronautics and Space Administration, Washington, D.C.

RADIATION REACTIONS AND CHEMICAL PROTECTION OF ANIMALS EXPOSED TO HIGH-ENERGY PROTONS

S. P. Yarmonenko, E. B. Kurlyandskaya, G. A. Avrunina, Ye. S. Gaydova, R. D. Govorun et al *In its Aviation and Space Med.* Dec. 1964 p 442-445 (See N65-13626 04-04) OTS: HC \$7.63/MF \$2.25

Results are presented of comparative experiments on mice receiving whole-body radiation from protons and from γ -rays of Co⁶⁰. The relative biological effectiveness of the protons on hematopoiesis, on reproductive function, and on somatic mutations was consistently lower than that of γ -rays. The effectiveness of chemical protection by preliminary injection with S, β -aminoethylisothiuronium, mercaptoethylamine, and 5-methoxytryptamine is discussed. Further information was obtained on the effect of protons on blood protein fractions, and the long-range blastomutagenic effects. R.L.K.

N65-13804# Liège U. (Belgium).

RESEARCHES PERFORMED ON THE EFFECTS OF CERTAIN CHEMICAL RADIOPROTECTORS, YEARS 1962-1963 [RECHERCHES SUR LES EFFETS MULTIPLES DE CERTAINS RADIOPROTECTEURS CHIMIQUES, ANNEES 1962-1963]

Brussels, EURATOM, Aug. 1964 14 p In FRENCH; ENGLISH summary

(Contract EURATOM-006-61-12 BIOB)

(EUR-1835.f) Available from Belgian Am. Bank and Trust Co., Account No. 22.186; 40 Belg. Fr.

The research includes the following: biochemical, pharmacological, and cytological effects of cysteamine and its main metabolites and of cystamine on various animal systems (for instance, mouse ascites tumor, isolated frog heart, mouse hair, chicken embryo, cat nictating membrane); (2) effects of cysteamine on different enzymatic systems in vitro, on bile components, and on hepatic mitochondria; and (3) effects of various radioprotectors on microorganisms (*E. coli*) and on plants (cytoplasmic stream of *Nitella*, growth of barley seedlings). Author

N65-13827*# National Aeronautics and Space Administration, Washington, D.C.

EXPERIMENTAL INVESTIGATIONS ON ULTRA-LOW FREQUENCY DISPLACEMENT BALLISTOCARDIOGRAPHY [EXPERIMENTELE ONDERZOEKINGEN OVER DE ULTRA-LAAGFREQUENTE VERPLAATSINGSBALLISTO-CARDIOGRAFIE]

Antonius Adrianus Knoop (Ph.D. Thesis—Amsterdam U., 1962) Jan. 1965 112 p refs Transl. into ENGLISH from DUTCH (NASA-TT-F-269) OTS: HC \$4.00/MF \$0.75

The historical development of ballistocardiography is traced, nomenclature for ballistocardiographic methods is given, and the calibration of apparatus is described. The ballistocardiogram of man is discussed in relation to methods for determining the stroke volume and for recording the ballistocardiogram, the blood pressure, and the electrokymogram. The ballistocardiogram of the dog is described, the influence of the recording-axis direction on the graph is discussed, and some aspects of the genesis of the ballistocardiogram of the dog are presented. Effects of aortic occlusion, vasodilator drugs, norepinephrine, pitressin, and respiratory arrest on ballistocardiograms are discussed. D.E.W.

N65-13829*# National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY—A CONTINUING BIBLIOGRAPHY

Dec. 1964 151 p refs (NASA-SP-7011(05)) OTS: HC \$1.00/MF \$1.00

Abstracts are included that refer to the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References

describing similar effects on lower organisms are also covered. Attention is given to such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors. R.L.K.

N65-13845# Argonne Cancer Research Hospital, Chicago, Ill.
THE CONSEQUENCES OF INGESTION BY MAN OF REAL AND SIMULATED FALLOUT

George V. Le Roy, John H. Rust, and Robert J. Hasterlik [1963] 36 p refs
 (Contracts AT-(11-1)-69; OCD-OS-62-214)
 (ACRH-102)

Real and simulated particulate fallout and solutions of $\text{Sr}^{85}\text{Cl}_2$ and $\text{Cs}^{134}\text{Cl}_2$ were fed to 102 healthy volunteers. Absorption and retention of ingested radioactivity was measured by whole-body counting, using a gamma-ray spectrometer. An average of 3% of the radioactivity of week-old local fallout was absorbed; the range was 0% to 9%. Strontium and cesium leached or dissolved from simulated fallout behaved in the same way, metabolically, after absorption as they did when the tracer was swallowed in a solution or injected intravenously. The large number of subjects studied provided additional information of the range of variation of intestinal motility, biological availability of strontium, cesium and barium following ingestion of fallout, and retention of the radionuclides of these elements. Author

N65-13861*# General Technical Services, Inc., Cleveland, Ohio.

GENERAL DYNAMICS OF PHYSICAL CHEMICAL SYSTEMS IN MAMMALS First Quarterly Progress Report, 1 Jun.-20 Nov. 1964

A. S. Iberall 7 Dec. 1964 5 p
 (Contract NASw-1066)

(NASA-CR-59990) OTS: HC \$1.00/MF \$0.50

A dynamic oscillator instrument concept for medical diagnosis is being developed based on the spectral analysis of cyclic phenomena of mammals. It has been modeled from a spectrum of sustained limit cycle oscillations evident from studies of human thermoregulation, cardiovascular, hormonal, and behavioral systems. In the appended abstract of the human thermoregulation study, the 100-sec cycle is considered as the basic engine cycle and the vehicle for heat production; its regulation arises primarily in the skeletal muscles from unstable units. The 400-sec cycle is a hormonally mediated cycle arising from the hypothalamus and regulating the overall blood flow. Since the peripheral circulation is the major vehicle for surface temperature regulation and heat dissipation control, it is concluded that the 400 sec blood flow cycle is the major thermoregulator. G.G.

N65-13863# Joint Publications Research Service, Washington, D.C.

CHANGES IN THE NERVOUS SYSTEM - IN VERTIGO AND AFTER TERMINAL CONDITIONS

7 Jan. 1965 27 p refs Transl. into ENGLISH from Klinicheskaya Meditsina (Moscow), v. 42, no. 9, Sep. 1964 (JPRS-28177; TT-65-30081) OTS: \$2.00

Overloading of the vestibular analyzer induces an illusion of movement of the body or surrounding objects (dizziness) and impairment of maintaining equilibrium. Vertigo associated with pathological changes in the peripheral part of the vestibular analyzer is discussed. Vestibular disorders, including vertigo, may be observed in lesions of various parts of the nervous system. Meniere's disease is the most frequent cause of vertigo. Changes of the nervous system in patients who

have sustained terminal states were observed, and an attempt was made to elucidate the properties of neurological disturbances, and their nature and extent in various stages of terminal states. E.C.

N65-13955# Gt. Brit. Dept. of Scientific and Industrial Research, Warren Spring Lab.

HUMAN SCIENCES IN INDUSTRY. PART I: ERGONOMICS
Annotated Bibliography

Sep. 1964 133 p refs

Included are abstracts of studies reported on in a variety of domestic and foreign professional journals, in conference proceedings, and in other documents. Categories cover ergonomics; systems of men and machines; visual inputs and processes; auditory inputs and processes; other sensory inputs and processes; input channels—choice and interaction; body measurements, basic physiological capacities, basic and complex motor performance; design of controls and integration with displays; layout of panels and consoles; design of work space, equipment, and furniture; clothing and personal equipment; special environmental factors affecting performance; individual factors, work conditions, and task characteristics that affect behavioral efficiency; training aids and devices and their use; personnel psychology and social psychology relevant to ergonomics. R.L.K.

N65-13965*# National Aeronautics and Space Administration, Washington, D.C.

EVALUATING THE STATE AND ACTIVITY OF CREW MEMBERS UNDER CONDITIONS OF PROLONGED SPACE FLIGHT [VOPROSY OTSENKI SOSTOYANIYA I DEYATEL'NOSTI CHLENOV EKIPAZHA V USLOVIYAKH DLITEL'NOGO KOSMICHESKOGO POLETA]

I. T. Akulinichev and R. M. Bayevskiy Jan. 1965 10 p Transl. into ENGLISH of a paper presented at the Fifteenth Intern. Astronautical Congr., Warsaw, 7-12 Sep. 1964

(NASA-TT-F-271) OTS: HC \$1.00/MF \$0.50

Discussed are the problems of operational medical supervision during space flight. New methods of investigating astronaut activity in controlling the spacecraft are described. These include analysis of coordination impairment in astronauts' handwriting and programed medical investigations. A flight measurement system is proposed and schematically represented. A new branch of space medicine—flight medicine—is suggested; it involves reciprocal monitoring of the condition of the crew during flight. R.L.K.

N65-13993# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

A COMPARISON OF PERFORMANCE IN OPERATING THE CRL-8 MASTER SLAVE MANIPULATOR UNDER MONOCULAR AND BINOCULAR VIEWING CONDITIONS

Gerald P. Chubb Oct. 1964 17 p refs
 (AMRL-TDR-64-68; AD-608791)

Performance times were recorded for six subjects on a simple remote-handling task under two direct viewing conditions: binocular and monocular. All subjects performed under both conditions with counterbalancing between subjects and within subjects between sessions (I and II). The subjects used a CRL Model 8 master-slave manipulator to perform a shortened and revised version of the Placing Subtest of the Minnesota Rate of Manipulation Test. Performance times for the monocular viewing condition were 20% greater, exhibited greater variability, and reached an asymptotic level later. Author

N65-13994# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

CARDIOPULMONARY MEASUREMENTS OBTAINED BY RIGHT AND LEFT CARDIAC CATHETERIZATION OF MACACA MULATTA

Ralph O. Hayden Oct. 1964 11 p refs
(AMRL-TDR-64-69; AD-608790)

Eight normal *Macaca mulatta* anesthetized with pentobarbital were subjected to right and retrograde left heart catheterization and to analysis of expired gas. Measurements were made of the aortic, left ventricular, pulmonary capillary, pulmonary arterial, right ventricular and right atrial pressures, heart rate, cardiac and stroke index, peripheral and pulmonary vascular resistance, tension-time index, systolic ejection period and rate index, left ventricular work and stroke index, minute respiratory volume and oxygen consumption index, and arterial and mixed venous blood oxygen content and saturation. The data will serve as a baseline for cardiopulmonary studies with this species. Author

N65-13995# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

EFFECTS OF DISPLAY POLARITY ON TARGET DETECTION WITH SIDE-LOOKING RADAR Technical Report, Jan.-Jun. 1964

Barbara A. Van Ausdall and Herschel C. Self Oct. 1964 38 p
(AMRL-TR-64-82; AD-609246)

Side-looking radar imagery was displayed on a 14- by 14-inch display at a scale of 1:176000 and at 950 knots simulated aircraft speed. Nineteen SAC and TAC radar navigators were randomly assigned to two groups. One group was tested on a positive copy and the other on a negative copy of the same film. The average subject on the positive display detected significantly more targets (38.4%) than the average (32.1%) on the negative display. Target detection times on the positive display were significantly shorter. There was no significant difference between groups in number of responses to nontarget objects. For detections the distributions of confidence judgments were not significantly different; for nontarget objects the negative group was only half as likely to express high confidence that they were targets. For both types of display there were positive and significant correlations between maximum target dimension and probability of detection. Author

N65-13996# Air Force Systems Command, Wright-Patterson AFB, Ohio. Behavioral Sciences Lab.

HUMAN PERFORMANCE AS A FUNCTION OF INTENSITY OF VIBRATION AT 5 CPS Final Report, 31 Oct. 1963-11 Mar. 1964

Charles S. Harris, W. Dean Chiles, and Robert M. Touchstone Sep. 1964 17 p refs
(AMRL-TR-64-83; AD-607760)

The effect on human performance of whole-body vibration at a frequency of 5 cps was investigated. Ten subjects were tested on a two-dimensional tracking task at four double amplitudes of vibration, 0.08, 0.12, 0.16, and 0.20 inch. Only the two highest levels produced a decrement in performance. No subjective or performance aftereffects were found following any of the four 20-minute periods of continuous vibration. Author

N65-13997# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

CURRENT STATUS OF THE TECHNOLOGY OF TRAINING Gordon A. Eckstrand Sep. 1964 33 p refs Presented at the 72d Ann. Conv. of the Am. Psychol. Assoc., Los Angeles 4-9 Sep. 1964

(AMRL-TR-64-86; AD-608216)

The processes involved in designing a training system are arbitrarily analyzed into the following three areas: (1) determining training requirements, (2) developing the training environment, and (3) measuring the results of training. In each of these areas, an attempt is made to summarize and evaluate the adequacy of the technology. Author

N65-13998# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

PILOT AIRCRAFT AIMING PERFORMANCE

Melvin H. Rudov Sep. 1964 17 p
(AMRL-TR-64-87; AD-608792)

Six test pilots, using a specially instrumented F-100D, flew nine dives each at a ground target. The task was to align the aircraft with the target as quickly as possible. Initial altitude (7000, 8000, or 9000 feet), dive angle (10°, 20°, or 30°), slant range at alignment (6035 to 50 969 feet), and individual pilot differences did not affect accuracy of alignment. Turbulence, as judged by the pilots, decreased both accuracy and task time. Mean task performance time was approximately nine seconds, and mean accuracy was approximately five minutes visual angle. Author

N65-13999# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

A MECHANICAL IMPEDANCE INVESTIGATION OF HUMAN RESPONSE TO VIBRATION

Richard G. Edwards and Karl O. Lange (Kentucky U.) Oct. 1964 35 p refs Res. Conducted at Wenner-Gren Aeron. Res. Lab., Ky. U. under contract AF 33(616)-7766
(Contract AF 33(616)-7766)
(AMRL-TR-64-91; AD-609006)

To help establish the dynamics of the human body the mechanical impedance was measured as two subjects were exposed to vertical sinusoidal motion at frequencies from 1 to 20 cps. The impedance in the supine, lateral, and standing subject positions and its variation, due to voluntary change in muscle tone and to padding the support, were determined. In all tests the frequency interval from 5 to 7 1/2 cps was found to contain the initial whole-body resonance. Nonlinearity of the response, as established by impedance dependence upon shake table acceleration level, was observed by altering the peak shake table acceleration from 0.2 to 0.35 to 0.5 g. The degree of nonlinearity was found to be dependent upon subject position, as well as subject physiological differences. Changes in support padding and muscle tone produced substantial alterations in impedance but little variation of resonant frequencies. Author

N65-14000# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

INFLUENCE OF FIRST TASK PRACTICE AND INTERTASK SIMILARITY ON TRANSFER OF TRAINING IN A SYMBOL SUBSTITUTION TASK

Marvin Levine, Ross L. Morgan, and Alan D. Neiberg Oct. 1964 23 p refs
(AMRL-TR-64-96; AD-608598)

This experiment investigated the effects of degree of learning of a first task and degree of similarity between two tasks on the transfer of training from the first to the second task. The basic relationship between the two tasks was such that learning the first might well interfere with learning the second. Twelve groups of 15 college students learned a symbol substitution task to one of four levels of mastery. They were then transferred to a task where the symbols in task I were rearranged to permit three degrees of intertask similarity. Extensive and persistent negative transfer was obtained. During the initial stages of learning task II, negative

transfer seemed to decrease as the degree of learning of task I increased. However, during the later stages of task II, negative transfer seemed to increase with an increase in the degree of learning of the first task, especially with the higher degrees of learning of task I. The intertask similarity variable appeared to be significant only during the early stages of learning the second task. Author

N65-14001# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
A PRELIMINARY STUDY OF THE EFFECTS OF BRIEFING LEVELS ON RECONNAISSANCE PERFORMANCE WITH SIDE-LOOKING RADAR Technical Report, Jan.-Mar. 1964
 J. C. Welch and Don F. Mc Kechnie Oct. 1964 25 p ref (AMRL-TR-64-101; AD-608887)

Sixteen Air Force navigators were tested, after appropriate training, on four strips of side-looking radar imagery. The imagery, at a scale of 1:197 000, moved across a back-lighted 14- by 14-inch screen at 3.3 inches per minute, corresponding to 500 knots. The subject's task was to identify all air fields, bridges, tank farms, power lines, and railroad yards. The speed and accuracy of locating and identifying these targets under four different levels of briefing were assessed. The four briefing levels were: none, 10 minutes study of the corresponding chart prior to the simulated flight, access to the chart during but not prior to the flight, 10 minutes study of the chart prior to the flight and access to it during the flight. Fifty-six percent of the targets were correctly identified. On the average the target traveled 3.1 inches (56 seconds) after first appearing on the screen before being identified. False positive responses averaged 30%. Author

N65-14002# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
ABSOLUTE JUDGMENTS OF LIGHT INTENSITY Technical Report, Aug. 1963-Jul. 1964
 Richard E. Wienke Oct. 1964 13 p refs (AMRL-TR-64-103; AD-609050)

The assumption was made that absolute judgments of luminance could be made providing the eye remained in a relatively constant state of dark adaptation during the judgmental process. This hypothesis was tested by presenting each of 12 naive subjects with a preselected, random series of five stimuli which ranged from stellar magnitude 2.30 to 5.33. Each subject made 200 judgments at the approximate rate of three per minute. Results indicated two stimuli lying about 0.90 stellar magnitudes apart were confused, but near certainty of discrimination occurred when two stimuli were separated by approximately 1.40 stellar magnitude. Author

N65-14003# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
THE EFFECT OF TEST TRIALS ON THE LEARNING OF PAIRED ADJECTIVES Technical Report, Jul. 1963-Aug. 1964
 Kirk A. Johnson Oct. 1964 21 p refs (AMRL-TR-64-105; AD-609317)

Three experiments were conducted to determine the extent to which blocks of test trials contribute to the learning of paired adjectives. The results were compared to those found in an earlier study of the relative effectiveness of various modes of the subject-matter trainer. The earlier study indicated that learning by means of the quiz mode, under conditions in which blocks of trials in the quiz mode were alternated with blocks of test trials, was considerably superior to learning by means of several other modes, none of which involved test trials. In the present experiments, the addition of blocks of test trials

to blocks of learning trials led to improvements in learning. This was true whether learning was by means of prompting or anticipation trials. The improvements were comparable in magnitude to the trial-by-trial differences found between the quiz mode and two of the remaining modes used in the previous study. Author

N65-14004# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
PYRIDOXINE (VITAMIN B₆) TOXICITY Literature Review, 1940-June 1963
 Robert A. Schneider Oct. 1964 17 p refs (AMRL-TR-64-106; AD-608841)

The literature from 1940 through June 1963 was surveyed to summarize the data from pyridoxine toxicity studies in animals and to ascertain the highest doses of pyridoxine (Vitamin B₆ analogs) that have been administered to human subjects as a therapeutic measure with no clinical evidence of toxicity. Analysis of the data indicated that doses of 25 mg/kg pyridoxine hydrochloride should be well tolerated as a therapeutic measure when required. In particular, pyridoxine hydrochloride can be used in the specific treatment of a clinical entity such as acute UDMH intoxication. Author

N65-14007# Zaret Foundation, Inc., Scarsdale, N.Y.
AN EXPERIMENTAL STUDY OF THE CATARACTOGENIC EFFECTS OF MICROWAVE RADIATION Final Report, 8 May 1963-7 May 1964
 Milton M. Zaret et al Griffiss AFB, N.Y., RADC, Oct. 1964 27 p refs Prepared in cooperation with New York U. and Polytechnic Inst. of Brooklyn (Contract AF 30(602)-3087) (RADC-TDR-64-273; AD-608746)

An exploratory investigation was performed to determine the applicability of spectrophotometric analysis to the measurement of cataractogenesis. It was found that standard spectrophotometric techniques cannot be utilized for this purpose, but that a new method for performing spectrophotometry in the living eye, which is known as retinal reflection densitometry, shows promise of being capable of performing this task. A methodology is presented for an applied research investigation of cataractogenesis in order to delineate the parameters of personnel hazard associated with microwave environments. The biological and microwave experimental protocols, as well as the relationship of laboratory-induced cataractogenesis to the clinical study of human microwave cataracts are discussed. Author

N65-14026# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SUPERSONIC AIR COMMERCE-PROBLEMS AND PROJECTS

Jochen Grenzdoerfer 9 Sep. 1964 27 p Transl. into ENGLISH from Aerosport (Germany), no. 1, 1964 p 1-11 (FTD-TT-64-463/1+2; AD-450605)

Capitalist and socialist approaches to the construction and use of supersonic transports are compared. The U.S. and British-French models are evaluated. The safety record of jet airlines in capitalist countries is cited. The sound and heat barriers are discussed. The operational profile for a Mach 3 airliner suggests passing through the sound barrier at an altitude of about 13 km. A fuselage composed of aluminum and titanium alloys is suggested as suitable for the Concorde, as is pure steel for the American Mach 3 SST. Other problems mentioned are cabin pressurization, cosmic radiation, flight safety, and fuel consumption. R.L.K.

N65-14061# Illinois U., Urbana. Group Effectiveness Research Lab.

THE QUASI-THERAPEUTIC EFFECTS OF INTER-GROUP COMPETITION

James W. Julian, Doyle W. Bishop, and Fred E. Fiedler Oct. 1964 24 p refs

(Contract DA-49-193-MD-2060)

(TR-19; AD-608517)

Nine combat engineering squads competed in their training and garrison duties to test the hypothesis that intergroup competition promotes close interpersonal relations among group members and improves morale and adjustment. Eighteen squads for whom no changes in training were introduced served as controls. Questionnaire measures of interpersonal relations and adjustment were obtained before and after a 3-month experimental period. Changes in self-perception and reactions to military life indicated clearly the relative improvement in adjustment of the members of competitive squads as compared with members of control squads. Men trained under competitive conditions also had a lowered level of manifest anxiety on the Taylor scale. Improvements in the quality of interpersonal relations was indicated by a significantly greater change in within-squad sociometric choices of combat leaders and work partners for the members of competitive squads. However, these improvements did not generalize to nontask aspects of relations among squad members. Author

N65-14083# New York U., N.Y.

ENCODING IN THE PERCEPTUAL (VISUAL) SERIAL POSITION EFFECT

Murray Glanzer Dec. 1964 20 p refs

(Contract DA-49-193-MD-2496)

(AD-609101)

On the basis of the verbal hypothesis, specific changes in the shape of the perceptual serial position curve were predicted as a function of encoding, or verbalization, length of the stimulus, and stimulus exposure time. The effects of post-stimulus delay, both with and without an interpolated task, were investigated. Using eight-place binary numbers, a group of 12 subjects was tested to evaluate the effect of these four variables—verbalization length, exposure time, delay time, and interpolated task during the delay. As predicted, increasing the verbalization length and shortening the exposure time have similar effects. They tilt the serial position curve up on the right. The presence of an interpolated task produces an overall increase without, however, any effect on the shape of the serial position curve. Post-stimulus delay, within the range used in this study, produces no clear or systematic effect. Author

N65-14119*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

MEASURED HUMAN TRANSFER FUNCTIONS IN SIMULATED SINGLE-DEGREE-OF-FREEDOM NONLINEAR CONTROL SYSTEMS

Hugh P. Bergeron, Joseph K. Kincaid, and James J. Adams Washington, NASA, Jan. 1965 44 p refs

(NASA-TN-D-2569) OTS: HC \$2.00/MF \$0.50

Tests have been made to determine the variations in the transfer function of human pilots in simulated single-degree-of-freedom tasks due to various nonlinearities introduced into the pilot control system. The subjects included test pilots and engineers. The results show that variations in the measured gains did not occur in direct proportion to the variations made in the nonlinearities. An abrupt change did occur, however, in the measured gains of two of the pilots at low saturated control torques. The measured data from the single-axis tests

were applied to a multiloop problem. The results for this problem confirm the feasibility of this procedure. Author

N65-14157# Joint Publications Research Service, Washington, D.C.

MEDICAL PROBLEMS IN SPACE TRAVEL

Mikhail Novikov 5 Jan. 1965 7 p refs Transl. into ENGLISH from Trud (Moscow), 15 Oct. 1964 p 2

(JPRS-28113; TT-65-30042) OTS: \$1.00

Aeromedicine is considered as the basis of cosmic medicine. Specialists in cosmic medicine have a variety of duties and observations to perform. They take part in the selection of astronauts, accompany them on the space trip, and check the crew out after landing. Space physicians must be able to utilize supersensitive electronic devices to discover and prevent the slightest variations in the astronaut's condition; they also have to consider the biological compatibility of the crew members and their ecological environment during the space flight. The physician participates in plotting the cosmic routes, in selecting the system of a manned rocket, and in the design and creation of the spaceship. G.G.

N65-14164# Joint Publications Research Service, Washington, D.C.

PRINCIPLES OF MOLECULAR BIOLOGY: GENETICS AND SELECTION OF MICROORGANISMS

7 Jan. 1965 52 p refs Transl. into ENGLISH of two chapters from the book "Osnovy Molekularnoy Biologii: Genetika i Seleksiya Mikroorganizmov" Moscow, 1964 p 31-60, 151-164

(JPRS-28187; TT-65-30091) OTS: \$3.00

In "Molecular Mechanisms of Chemical Mutagenesis in the Bacteriophage, the interaction of mutagens with DNA is discussed. The effects of base analog and acridine mutagens on the synthesis of DNA, the induction of direct mutations, and mutation frequency due to nitrogen base analogs are also reviewed. Enzyme synthesis and genetic regulation due to induction, repression, and retroinhibition are discussed in *Genetic Mechanisms of the Regulation of Protein Biosynthesis in Microorganisms*. The connection between protein structure and its biological activity is also investigated. M.G.J.

N65-14173# European Organization for Nuclear Research, Geneva (Switzerland). Health Physics Group

RADIOBIOLOGICAL PROBLEMS IN PROTECTION, PREVENTION AND THERAPY OF HIGH-ENERGY RADIATION INJURY

Antonio Pasinetti 1 Apr. 1964 55 p refs

(DI/HP/39)

Protective measures, prevention, and therapy of radiobiological injuries are considered in the following studies: *Some of the Biophysical and Biological Aspects of Ionizing Radiation*—the interaction between ionizing radiation and living matter, and the biological response to ionizing radiation; *Irradiation of Man; Pharmacological Protection; The Biological Aspects of High-Energy Radiation; Significance of the Maximum Permissible Doses: Their Value and Their Limitations; Steps to be Taken in the Event of Accidental Irradiation, and Emergency Measures; and Measures to Improve Safety Conditions*. G.G.

N65-14175# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering

A MATHEMATICAL MODEL OF THE HUMAN BODY

Ernest Patrick Hanavan, Jr. (M.S. Thesis) Aug. 1964 85 p refs

(GA/PHYS/64-3; AD-605487)

A 15-segment, personalized, mathematical model of the human body was designed using 25 anthropometric dimensions. Center of gravity, moments and products of inertia, principal moments, and principal axes were determined. Results for 66 subjects are compared with experimental data. The center of gravity is generally predicted within 0.7 inches, and moments of inertia within 10%. A generalized computer program to calculate inertial properties of any subject in any body position is described. The inertial properties of 5 composite subjects in 31 body positions are given in a design guide. The IBM 7094 digital computer programs are included.

Author

N65-14261# Joint Publications Research Service, Washington, D.C.

APPARATUS FOR ELECTROPHYSIOLOGICAL INVESTIGATIONS

D. D. Dauson, V. P. Podachin, and A. I. Rybalko 11 Jan. 1965 16 p refs Transl. into ENGLISH from the book "Mekhanizmy Kompensatornykh Prispособleniy" Moscow, Acad. of Sci. USSR, 1964 p 193-202 (JPRS-28225; TT-65-30106) OTS: \$1.00

A two-channel apparatus for electrophysiological investigations is described, consisting of a complex of apparatus permitting the investigation of spontaneous and induced phenomena in the nervous system and other tissues. The apparatus permits: (1) studying bioelectrical phenomena in the nervous system; (2) applying single and rhythmic electric stimuli of a prescribed magnitude; (3) observing visually simultaneous hearing and recording processes on moving and immobile film; (4) accurate regulating of the distribution of events within the limits of a prescribed cycle (up to 10 seconds $\pm 1\mu\text{sec}$). Author

N65-14282# Arizona U., Tucson.
AN INVESTIGATION OF THE TRACKING CAPABILITY OF A HUMAN PILOT

Walter Hansen (M.S. Thesis) 1964 61 p refs (AD-603477) OTS: \$3.00

This thesis investigates the tracking capability of human pilots and also arrives at suitable transfer functions that can be used as mathematical representations of a human pilot subjected to small perturbations in the pitching and rolling modes of flight. A simulator was constructed from salvaged aircraft parts and once completed represented a basic instrument flying configuration less the fact that the rudders were not free to move. The equations of motion were programed on an analog computer, and disturbances were fed into the system through the use of a function generator. Author

N65-14326# Agricultural Research Service, Riverside, Calif. Salinity Lab.

WATER TRANSFER FROM SOIL TO THE ATMOSPHERE AS RELATED TO SOIL PROPERTIES, PLANT CHARACTERISTICS AND WEATHER Annual Report, 1 Jul. 1963-30 Jun. 1964

W. R. Gardner, E. J. Doering, C. F. Ehlig, F. J. Miklich, and L. A. Richards Jul. 1964 98 p refs (RR-374; AD-421425)

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N65-14344# Aberdeen Proving Ground, Md. Human Engineering Labs.

HIGH-INTENSITY IMPULSE NOISE: A MAJOR PROBLEM
Robert F. Chaillet, George R. Garinther, David C. Hodge, and Fred N. Newcomb Aug. 1964 38 p refs (TN-4-64; AD-450726)

This report describes the impulse sound-pressure-level problem created by modern firepower and presents techniques for partially attenuating these levels at crew positions. It also discusses the effect of high-intensity impulse noise on hearing.

Author

N65-14350# Boeing Co., Wichita, Kan. Airplane Div.
SUBJECTIVE REACTION TO WHOLE-BODY VIBRATION. RESEARCH ON LOW FREQUENCY VIBRATION EFFECTS ON HUMAN PERFORMANCE

Robert E. Chaney Sep. 1964 86 p refs (Contract Nonr-2994(00)) (D3-6474; AD-607462) OTS: \$4.00

Ten male volunteers were utilized in a study of the perception of vibration. Four subjective reaction levels—perceptible, mildly annoying, extremely annoying, and alarming—were established. The Boeing Human Vibration facility, modified since previous tests, was the test instrument. Experimental controls and test methods were determined in a preliminary study. Subjective levels identified are generally at higher acceleration values than those of previous research. Possible reasons for the differences are discussed. Also, individual values established at a given subjective level are shown to be influenced by the magnitude of the immediately preceding vibration level. Physiological effects in the main correlate with previous findings.

Author

N65-14366# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

A STUDY OF AUDITORY FATIGUE CAUSED BY HIGH-INTENSITY ACOUSTIC TRANSIENTS

Michael H. L. Hecker and Karl D. Kryter 15 Oct. 1964 37 p refs (Contract DA-49-007-MD-985) (Rept.-1158; AD-450707)

An experiment is described in which groups totaling 21 subjects were exposed to 100, 200, and 400 acoustic impulses presented at the rate of 1 impulse/sec at a peak intensity of 157 dB SPL. The impulse waveform featured a rise time of 0.25 msec and a positive pressure phase of 0.50 msec. Less TTS₂ was observed for these impulses than was reported by Carter and Kryter under comparable conditions for impulses

having a longer rise time and a longer pressure phase. The variability of TTS_2 obtained in the present experiment, representing individual differences in susceptibility, was similar to the variability reported by Carter and Kryter. In addition to these topics, questions pertaining to the effects on TTS_2 of impulse repetition rate, number of impulses presented, and impulse intensity are also discussed. Author

N65-14407# Aberdeen Proving Ground, Md. Human Engineering Labs.

THE EFFECTS OF REPEATED CONFINEMENT ON THE PERFORMANCE OF MEN IN A TEMPERATE ENVIRONMENT

Samuel A. Hicks Aug. 1964 28 p refs
(TM-11-64; AD-450714)

This investigation is designed to determine changes in general combat-relevant performance as a result of sustained confinement in armored personnel carriers. The present study examined the effects of repeatedly confining a single group of subjects for a 12-hour period on each of five successive days. Ninety enlisted men took tests measuring equilibrium, stamina, gross motor coordination, and marksmanship. There were statistically significant losses in all areas after the initial confinement period. Subsequent confinements showed progressively smaller decrements until, at the end of the final (fifth) session, the subjects performed at the preconfinement level. It was concluded that repeated exposure to confinement produces an adaptation phenomenon that voids the obviously transient effects that accompany intermittent exposure. The results support those of a previous study in a hot-wet environment. Author

N65-14413# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering

AN INVESTIGATION OF THE APPLICATION OF SPATIAL VECTORELECTROCARDIOGRAPHY TO PROBLEMS OF CENTRAL CARDIOVASCULAR SYSTEM CONSTRAINT
David Clifford Westhorp (M.S. Thesis) Aug. 1964 58 p refs
(GE/EE/64-23; AD-607534) OTS: \$3.00

Methods to determine heart position under conditions of vibration by using vectorelectrocardiographic techniques were investigated. An experiment to validate a theory is described, based on conductivity inhomogeneities of tissues surrounding the heart and proposing amplitude modulation of electrocardiographic wave form frequency components under conditions of sinusoidal vibration. Results are presented which show that frequency analysis of the wave form does not yield the desired displacement information due to lack of physiological standardization. A proposed method of extending Ernest Frank's mirror image cancellation method to vibration problems by using time sampling and computer data reduction is presented. Author

N65-14420# Texas Christian U., Fort Worth. Inst. of Behavioral Research

DIMENSIONS OF STIMULUS SITUATIONS WHICH ACCOUNT FOR BEHAVIOR VARIANCE Annual Progress Report
S. B. Sells 1 Oct. 1964 6 p refs
(Contract Nonr-3436(00))
(AD-607810)

The following summary of work accomplished and in progress is organized under four headings: (1) taxonomic analysis of situational variables; (2) analysis of group dimensions; (3) influence of meteorological variables on behavior; and (4) bibliographic review of behavioral ecology. Author

N65-14436# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering

COUNTERROLLING OF THE HUMAN EYE

Richard J. Flaherty and Gary K. Pritchard (M.S. Thesis) Aug. 1964 108 p refs
(GE-EE-64-8; AD-607482)

Counterrolling is a conjugate rolling movement of the eye around the line of sight opposite to the lateral inclination of the head. Measurements of counterrolling were obtained for four subjects (three normal and one labyrinthine defective) for static positions of lateral head (body) tilt and for vertical rotation in the frontal plane at constant rates up to 30 rpm. A specially designed rotating chair and cine photographic technique were used. The measured static counterrolling responses compared favorably with those obtained by other investigators. The dynamic counterrolling responses were similar to the static responses except for a constant time lag of 1/3 second and a decrease in amplitude. Author

N65-14449*# Serendipity Associates, Los Angeles, Calif.

REQUIREMENTS AND CONSTRAINTS OF POTENTIAL ROLES OF SUPERSONIC TRANSPORT CREWS

Harold E. Price, Richard A. Behan, and William J. Ereneta
Washington, NASA, Jan. 1965 384 p refs
(Contract NAS2-2209)

(NASA-CR-146) OTS: HC \$7.00/MF \$2.00

The principal sections of the report contain information on flight profiles, supersonic transport (SST) requirements and constraints, and potential roles of the SST crew. The discussion of flight profiles includes the anticipated flight profiles or flight envelopes for SST, descriptions of individual phases of the flight profile, and separate discussions of the sonic boom, and air traffic control factors as they affect the flight profile. Requirements and constraints expressed by many individuals and organizations are reviewed; a limited analysis is presented of each group of requirements and constraints as it affects the crew. Potential roles of the flight crew are described in terms of system considerations which affect the flight crew, crew role variables, operational considerations and the crew, crew composition, and flight deck concepts. D.E.W.

N65-14451*# National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Tex.

GASEOUS ENVIRONMENT CONSIDERATIONS AND EVALUATION PROGRAMS LEADING TO SPACECRAFT ATMOSPHERE SELECTION

Edward L. Michel, George B. Smith, Jr., and Richard S. Johnston
Washington, NASA, Jan. 1965 401 p refs
(NASA-TN-D-2506) OTS: HC \$8.50/MF \$2.00

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4. BACTERIOLOGICAL STUDIES OF TWO-MAN SPACE CABIN SIMULATOR J. E. Moyer and Y. Z. Lewis p 86-99 refs (See N65-14455 04-04)

5. EFFECTS OF PROLONGED EXPOSURE TO PURE OXYGEN ON HUMAN PERFORMANCE W. M. Helvey, G. A. Albright, F. B. Benjamin, L. S. Gall, J. M. Peters et al (Republic Aviation Corp.) p 100-474 refs (See N65-14456 04-04)

6. THE EFFECT OF SEQUENTIAL EXPOSURE TO ACCELERATION AND THE GASEOUS ENVIRONMENT OF THE SPACE CAPSULE UPON THE PHYSIOLOGIC ADAPTION OF MAN R. E. Mammen, G. T. Critz, D. W. Dery, F. M. Highly, Jr., and E. Hendler (Naval Air Mater. Center) p 475-518 refs (See N65-14457 04-04)

N65-14452* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

RAPID DECOMPRESSION HAZARDS AFTER PROLONGED EXPOSURE TO 50% OXYGEN-50% NITROGEN ATMOSPHERE

Morris J. Damato, Francis M. Highly, Edwin Hendler, and Edward L. Michel *In its Gaseous Environment Considerations and Evaluation Programs Leading to Spacecraft Atmosphere Selection* Jan. 1965 p 7-24 refs (See N65-14451 04-04) OTS: HC \$8.50/MF \$2.00

In studying the rapid decompression hazard following exposure to a proposed space capsule atmosphere, tests were conducted with subjects breathing a 50% oxygen-50% nitrogen mixture for various durations at a simulated altitude of 18000 feet prior to rapid decompression to a simulated altitude of 35000 feet. It was found that: (1) during repeated exposures, recurrence of bends in the same area is very likely; (2) the manifestation of bends may be delayed for more than 2 hours following decompression; and (3) characteristic sensations of bends may be either localized in one area or may radiate eventually to involve more than one area simultaneously. Procedures which, when applied prior to decompression, minimize the incidence of bends are outlined. P.V.E.

N65-14453* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

PHYSIOLOGIC EFFECTS OF EXPOSURE TO INCREASED OXYGEN TENSION AT 5 psia

Thomas E. Morgan, Jr., Ralph G. Cutler, Emil G. Shaw, Frode Ulvedal, John L. Hargreaves et al *In its Gaseous Environment Considerations and Evaluation Programs Leading to Spacecraft Atmosphere Selection* Jan. 1965 p 25-56 refs (See N65-14451 04-04) OTS: HC \$8.50/MF \$2.00

The effects of prolonged (14-day) exposure to a total pressure of 258 mm Hg and a P_{O_2} of 242 mm Hg were studied in 4 men. No distinct evidence of atelectasis was noted based on the following data: arterial P_{O_2} , alveolar P_{O_2} , estimated A-V shunt, chest X-ray, vital capacity, and performance. No hematological disorders were noted that were directly attributable to the oxygen-rich environment. One subject did develop a self-limiting anemia of nonspecific origin and possibly complicated by repeated blood samples during the course of the experiment. Symptoms similar to those of oxygen toxicity were encountered in all subjects. The data obtained indicate that this atmosphere (242 mm Hg P_{O_2}) can be well tolerated for a 14-day period. Exposure for time periods much in excess of this duration should be approached with a certain degree of caution. Author

N65-14454* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

EFFECT OF VENTILATING AIR FLOW ON HUMAN WATER REQUIREMENTS

B. E. Welch, R. G. Cutler, J. E. Herlocher, J. J. Hargreaves, F. Ulvedal et al *In its Gaseous Environment Considerations and Evaluation Programs Leading to Spacecraft Atmosphere Selection* Jan. 1965 p 57-85 refs (See N65-14451 04-04) OTS: HC \$8.50/MF \$2.00

Experiments were conducted on two subjects wearing pressure suits in a spacecraft atmosphere of 5 psi and essentially 100% oxygen. Both men wore fitted, ventilated, full-pressure garments during a daily schedule consisting of two alternating 5-hour periods per man per day in the full suit, with the torso portion being worn the remainder of the time. Preliminary data indicated that the ventilated pressure garments had a marked, increasing effect on water requirements. The increase was influenced by suit inlet air temperature and by the environmental conditions surrounding the suit-man combination. Water requirements while wearing the suit continuously averaged 1196 cc/man/day with an inlet air temperature of 60.6° F. Heat loss from the body via evaporative cooling was greater than in a "shirt sleeve" environment but still did not assume a dominant role in maintaining thermal equilibrium. P.V.E.

N65-14455* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

BACTERIOLOGICAL STUDIES OF TWO-MAN SPACE CABIN SIMULATOR

James E. Moyer and Y. Z. Lewis *In its Gaseous Environment Considerations and Evaluation Programs Leading to Spacecraft Atmosphere Selection* Jan. 1965 p 86-99 refs (See N65-14451 04-04) OTS: HC \$8.50/MF \$2.00

Microbiological findings collected from three 14-day experiments conducted within the two-man space cabin simulator at the USAF School of Aerospace Medicine, Brooks AFB, indicated that no significant degree of microbic interchange occurred between individuals under conditions of close occupancy for the periods studied. Bacterial aerosol counts of the cabin atmosphere revealed no cumulative buildup of microorganisms with time. Water condensates from the heat exchangers connected to the full-pressure suits worn by the latter two individuals were subjected to quantitative and qualitative bacteriological analysis. Subsequent evaluation of stored-condensate samples revealed tremendous proliferation of the micro-organisms originally present. Author

N65-14456* Republic Aviation Corp., Farmingdale, N.Y. **EFFECTS OF PROLONGED EXPOSURE TO PURE OXYGEN ON HUMAN PERFORMANCE**

William M. Helvey, G. A. Albright, F. B. Benjamin, L. S. Gall, J. M. Peters et al *In NASA Manned Spacecraft Center, Houston, Tex. Gaseous Environment Considerations and Evaluation Programs Leading to Spacecraft Atmosphere Selection* Jan. 1965 p 100-474 refs (See N65-14451 04-04) OTS: HC \$8.50/MF \$2.00 (Contract NASr-92)

The objective of this study was to determine if exposure to a pure oxygen environment, such as that currently used in the Project Mercury spacecraft, would have detrimental effects on the health or performance of astronauts. A broad approach to the problems associated with pure oxygen at various barometric pressures in the absence of an inert gas was planned. Four groups of six men each were selected to live in an altitude chamber for a 2-week period. Three of the groups lived in an oxygen environment at total pressures of 3.8, 5.0, or 7.4 psi, and a fourth group served as a control in a sea-level (14.7 psi) environment of air. Detailed medical, physiological, hematological, biochemical, microbiological, and psychological studies were conducted on all subjects. Author

N65-14457* Naval Air Engineering Center, Philadelphia, Pa. Air Crew Equipment Lab.

THE EFFECT OF SEQUENTIAL EXPOSURE TO ACCELERATION AND THE GASEOUS ENVIRONMENT OF THE SPACE CAPSULE UPON THE PHYSIOLOGIC ADAPTION OF MAN

Robert E. Mammen, George T. Critz, Donald W. Dery, Francis M. Highly, Jr., and Edwin Hendler *In* NASA Manned Spacecraft Center, Houston, Tex. Gaseous Environment Considerations and Evaluation Programs Leading to Spacecraft Atmosphere Selection Jan. 1965 p 475-518 refs (See N65-14451 04-04) OTS: HC \$8.50/MF \$2.00 (NAEC-ACEL-498)

The combined effects of acceleration and continuous exposure for 14 days to 100% oxygen at 258-mm Hg pressure on subjects representative of the astronaut population were investigated. No evidence of physiological alteration was detected during the study with the exception of temporary impairment of peripheral scotopic vision. Hematological changes were detected during the study. The average drop in hemoglobin and hematocrit was significantly different from pretest figures. There was no rise in bilirubin or in urinary urobilinogen, a slight rise in reticulocytes, a significant rise in neutrophils and platelets, and a tendency to hypochromia and microcytosis. Electrocardiograms were uniformly normal, and dark adaptation showed a decrease in rate and final sensitivity at 17° nasal retinal field. No evidence was obtained to indicate that any physiological detriment of operational significance would be suffered by astronauts exposed to the test conditions. P.V.E.

N65-14470# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CZECHOSLOVAKIAN NEUROLOGY Selected Articles

3 Aug. 1964 36 p refs Transl. into ENGLISH from Cesk. Neurol. (Czechoslovakian), v. 26, no. 3, 1963 p 145-151, 169-173, 184-191 (FTD-TT-64-267/1+2; AD-450604)

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1. NEW DATA ON THE REFLEX ACTIVITY OF SPINAL CORDS FROM THE VIEWPOINT OF MUSCULAR PROPRIOCEPTION. CLINICAL APPLICATIONS. FINDINGS ON A NORMAL PERSON V. Skorpil and B. Drechsler p 1-13 refs

2. SIMPLE ANALYZER CARD FOR REGISTRATION OF EEG FINDINGS J. Klapetek p 14-21

3. EFFECT OF RADIATION ON HUMAN EEG E. Klimkova-Deutschova p 22-33 refs

N65-14471# California U., Berkeley. Electronics Research Lab.

REPORT ON EXPERIMENTS WITH THE OLFACTORY CORTEX OF THE CAT

G. G. Furman 17 Jan. 1964 43 p refs (Grants AF-AFOSR-62-340; NIH B-2537; FFRP-G-59-203) (Rept.-64-1; AD-430077)

Experiments with the stimulation of the olfactory cortex of the cat were conducted with the help of chronically implanted bipolar electrodes for recording and stimulation. The final response data were obtained by averaging 10 or more time responses so as to raise the signal-to-noise ratio. An analytic expression for the theoretical cortical response was obtained by means of a model which treats the primary cortical unit as a current generator of damped sinusoids. The theoretical curves, as generated by a digital computer, showed an excellent fit with some of the experimental curves. Some alternative theories are also discussed, because the present one

was not shown to be a unique solution. Nevertheless, it was thought that because it utilizes a new technique of spatial summation in a neuronal tissue, it provides a realistic basis for the analysis of evoked cortical potentials. Author

IAA ENTRIES

A65-11895

TARGET TRACKING BY PPI DISPLAY OR BY AUTOMATIC COMPUTER.

L. G  rardin (Compagnie Fran  aise Thomson-Houston, Paris, France).

Institute of Navigation, Journal, vol. 17, Oct. 1964, p. 414-418.

Examination of the basic performance of a plan position indicator (PPI) display with a human operator, and a special-or general-purpose computer to perform tracking. Account is taken of the psychological and physiological features of human vision and hence the mental association of the viewer. The computer is more precise but more costly, and, when saturated, the drop in performance is abrupt. The number of tracks handled by a human operator is small, but the brain is versatile and works well in confused situations, with a slower drop in efficiency than the computer. It is considered that, for the exploitation of a radar, man and machine are complementary. The machine must aid the operator in tracking in clear zones, which represent 80% or more of the area under surveillance. The clutter zones should preferably be automatically defined, which would allow excluding them from automatic processing and permit manual processing, or manual processing rate-aided by the computer's memory.

F. R. L.

A65-12081

RADIOBIOLOGICAL PROBLEMS POSED BY SPACE TRAVEL
[PROBLEMES RADIOBIOLOGIQUES POSES PAR LES VOYAGES SPATIAUX].

R. P. Delahaye and E. Tabusse.

Forces A  riennes Fran  aises, Oct. 1964, p. 481-492. In French.

Consideration of somatic effects after intense or chronic radiation, followed by examination of genetic effects and a brief discussion of supersonic flight radiation hazards. Present knowledge of somatic effects due to intense radiation is the result of studies relating to the victims of the Hiroshima and Nagasaki explosions and of atomic-reactor accidents; observations made on subjects treated with radioactive cobalt, and on victims of radioactive fallout. Chronic radiation effects are discussed with reference to possible shortening of life and as causative factors in cancer and leukemia. Some genetic effects of extraterrestrial radiation are briefly examined as far as they are known. Experimental results are considered to show that short-term, high-rate exposures cause more mutations than do long-term, low-rate exposures. Some genetic results of ionizing radiation on man are described and discussed, followed by comments on possible radiation effects on aircrews in high-altitude supersonic flight.

F. R. L.

A65-12397

PHYSIOLOGICAL HAZARDS OF LASER RADIATION.

M. J. Allwood (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England) and J. M. Flood (Royal Aircraft Establishment, Farnborough, Hants., England).

IN: LASERS AND THEIR APPLICATIONS; CONFERENCE, LONDON, ENGLAND, SEPTEMBER 29-OCTOBER 1, 1964.

Conference sponsored by the Electronics and Science Divisions of the Institution of Electrical Engineers, the Institute of Electrical and Electronics Engineers (United Kingdom and Eire Section), and the Institution of Electronic and Radio Engineers.

London, Institution of Electrical Engineers, 1964, p. 53-1 to 53-5.

Calculation of safety thresholds for the amount of high-energy-density laser light the human eye can absorb. It is graphically shown that transmission through ocular media is high for the radiations from the ruby (694.3) and neodymium lasers (1060 m  ). It is found that it is absorption of incident energy by the pigment of the retina and choroid that is responsible for local tissue damage. Equations are formulated allowing for such variables as size of the iris opening, degree of pigmentation, retinal image size, and

viewing conditions. It is shown that laser radiation can definitely and irreversibly damage the retina. It is strongly urged that the viewing of laser beams in any way, directly or indirectly, be avoided.

M. L.

A65-12431

IMAGE ON THE RETINA AND ITS TRANSFORMATION IN THE VISUAL SYSTEM [IZOBRAZHENIE NA SETCHATKE I EGO PREOBRAZOVANIE V ZRITEL'NOI SISTEME].

A. V. Luizov.

Uspekhi Nauchnoi Fotografii, vol. 10, 1964, p. 148-155. 11 refs. In Russian.

Discussion of the human eye in terms of optics and energy pulses. Three kinds of eye motion, tremor, drift, and jumps, are analyzed as factors in the human visual system. Kozlov's theory of color vision, one of the latest theories representing a notable breakthrough in the understanding of vision mechanism, is quoted at length. A formula is presented which relates the sharpness of vision, object contrast, background, and background brightness.

V. Z.

A65-12527

CIRCULATORY EFFECTS AND CARDIOPULMONARY ADAPTATION DURING FLIGHTS TO GREAT HEIGHTS.

R. E. Mitchell (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).

(Mexican Congress of Naval Medicine, 1st, Mexico City, Mexico, Oct. 14-18, 1963.)

Military Medicine, vol. 129, Dec. 1964, p. 1186-1190. 22 refs.

Discussion of cardiopulmonary responses and circulatory effects during flights at heights exceeding 64,000 ft. It is stated that there now are vehicles, some of which produce great accelerative and decelerative forces, capable of flights to great heights into a deficient ambient environment. Because of the unusual forces and the deficient environment, certain physiologic responses may occur. Generally man has tolerated the changes, at least within the limits of our present knowledge. However, the effects of certain aspects of the environment, particularly those of prolonged exposure to weightlessness, are not known and require further study. It is pointed out that, generally, there has been a great deal of experimentation, concerning all aspects of high-altitude flight, in preparation for spaceflight. However, because of the very limited experience in space, there is relatively little information to prove or disprove the experimental results.

(Author) M. M.

A65-12543

PHYSIOLOGY OF MAN IN THE SPACE ENVIRONMENT.

John Billingham (NASA, Manned Spacecraft Center, Houston, Tex.).

IN: MANNED SPACECRAFT - ENGINEERING DESIGN AND OPERATION.

Edited by Paul E. Purser, Maxime A. Faget, and Norman F. Smith. New York, Fairchild Publications, Inc., 1964, p. 105-123. 37 refs.

Analysis of those physical characteristics of man's environment in space which affect life support. Factors considered include requirements associated with total external pressure and inspired oxygen partial pressure, oxygen consumption and carbon dioxide production, environmental temperature, food, body water and mass balance, external ionizing radiation, the control of infection and chemical contamination, and biodynamics. The latter covers the effects of the exposure of the human body to forces, and the physiological responses to these forces. Biodynamic factors discussed include the effects of, and responses to, linear and angular accelerations, vibrations, and weightlessness. Considerations which must be taken into account when designing an artificial gravity environment are described.

P. K.

A65-12544

SOME PHYSIOLOGICAL CONSIDERATIONS OF SPACE FLIGHT - WEIGHTLESSNESS.

Lawrence F. Dietlein (NASA, Manned Spacecraft Center, Houston, Tex.).

IN: MANNED SPACECRAFT - ENGINEERING DESIGN AND OPERATION.

Edited by Paul E. Purser, Maxime A. Faget, and Norman F. Smith. New York, Fairchild Publications, Inc., 1964, p. 125-135. 24 refs.

Discussion of physiological reactions to the prolonged periods of weightlessness experienced during spaceflights. Data from the Mercury flights are discussed, and include cardiovascular measurements of electrocardiograph, respiration rate, blood pressure and temperature, metabolic measurements, and stress measurements of 17-hydroxycorticosteroids in plasma and urine, catecholamines and related metabolites in urine, and various psychomotor tests. Methods of biomedical ground simulation are described, as are studies of means to prevent the postflight orthostatic hypotensive phenomena observed in astronauts Cooper and Schirra. P.K.

A65-12545

LIFE-SUPPORT SYSTEMS.

Robert E. Smylie and Maurice R. Reumont (NASA, Manned Spacecraft Center, Houston, Tex.).

IN: MANNED SPACECRAFT - ENGINEERING DESIGN AND OPERATION.

Edited by Paul E. Purser, Maxime A. Faget, and Norman F. Smith. New York, Fairchild Publications, Inc., 1964, p. 137-159.

Analysis of the various functions of the life-support system for a manned spacecraft, and of methods to accomplish these functions. Problems and methods covered are those of: oxygen storage and supply, using high-pressure and cryogenic liquid storage, water electrolysis, chemical storage, and oxygen reclamation systems; thermal control, using surface coatings, expendable coolants, radiators, and a vapor-compression cycle; water separation and humidity control; fluid transport; carbon dioxide management, using lithium-hydroxide, molecular-sieve, and ion-exchange electro dialysis systems; contamination control, using controlled cabin leakage, standard filtration, charcoal adsorption, and catalytic combustion systems; the choice of instrumentation for determining the quality and quantity of the constituents of the spacecraft's breathing environment; waste management; and water management, using vacuum pyrolysis, vapor compression, electrodialysis, evaporation by air, and an electrolysis fuel-cell system. P.K.

A65-12546

SPACE SUITS.

Edward L. Hays (NASA, Manned Spacecraft Center, Houston, Tex.).

IN: MANNED SPACECRAFT - ENGINEERING DESIGN AND OPERATION.

Edited by Paul E. Purser, Maxime A. Faget, and Norman F. Smith. New York, Fairchild Publications, Inc., 1964, p. 161-168. 5 refs.

Review of the development of the pressure suit, from work by Haldane early in this century to extra-vehicular space suits. The full-pressure suit developed for military pilots of operational and research aircraft is described, as are the space suits for the Mercury and Gemini programs. The requirements for the Apollo extra-vehicular space suit are reviewed, and some characteristics of a prototype suit are noted. P.K.

A65-12574

INFLIGHT CREW ACTIVITIES.

Helmut A. Kuehnelt (NASA, Manned Spacecraft Center, Houston, Tex.).

IN: MANNED SPACECRAFT - ENGINEERING DESIGN AND OPERATION.

Edited by Paul E. Purser, Maxime A. Faget, and Norman F. Smith. New York, Fairchild Publications, Inc., 1964, p. 457-466.

Discussion of crew-activities flight plans for manned spaceflights. Flight-plan preparation and organization procedures are noted, and major activities are outlined, including systems checkout, engineering tests, and in-flight experiments and monitoring. Examples are given of the various portions of a detailed flight plan, of a summary flight plan, and of sunrise, sunset, moonrise, moonset, and star charts used on Mercury flights. P.K.

A65-12817

MEETING THE CREW MANAGEMENT REQUIREMENTS FOR A SPACE STATION LIFE SUPPORT SYSTEM IN DESIGN AND PROTOTYPE TESTS.

John R. Burnett (General Dynamics Corp., General Dynamics/Astronautics, San Diego, Calif.).

Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 5-9, 1964, Paper 908C. 10 p. 5 refs.

Members, \$0.75; nonmembers, \$1.00.

Contract No. NAS 1-2934.

Description of the development of a fully operating prototype of an integrated life-support system for spaceflight of extended time periods in a configuration as nearly representative of a flight system as feasible. The equipment system was to be a physical-chemical system providing atmosphere, water, food, waste, and thermal management capable of operating at zero gravity and of sustaining four men in the environment of space for periods up to one year with resupply at a 60 to 90 day interval. Considered are the analytical models, trade-off studies, specifications, design analysis, and equipment tests, all of which were formulated under an "all-parameter approach" providing continuous influence of the basic crew-management requirements. The equipment system developed is described. It can be operated and monitored by the average crew, and it provides continuous life support, with subsystems operating in any one of the several modes with alternate mode or back-up capability during subsystem repair. M.G.

A65-12882

EXPERIMENTAL INDUCTION OF SOME SENSATIONS CORRESPONDING TO FLIGHT ILLUSIONS OF THE VESTIBULAR APPARATUS [INDUCTION EXPERIMENTALE DE QUELQUES SENSATIONS. CORRESPONDANT AUX ILLUSIONS DE VOL. DE L'APPAREIL VESTIBULAIRE].

Vladimír Malčík (Institut de Médecine Aéronautique, Prague, Czechoslovakia).

(Association des Physiologistes, Session, Prague, Czechoslovakia, July 10, 1964.)

Rivista di Medicina Aeronautica e Spaziale, vol. 27, July-Sept. 1964, p. 307-317. 11 refs. In French.

Consideration of the problem of flight illusions as depending on the ability of flyers to disregard sensations from their own bodies and to rely on the instruments controlling the flight. It is stated that it is impossible to bring about flight illusions in the laboratory often impossible in an actual flight, and then hardly ever at the correct time. Therefore, the investigation of flight illusion is very difficult. Sensations very similar to those experienced by pilots in actual flight were successfully created under laboratory conditions. While the pilot performs a flying mission in a Link trainer, his vestibular apparatus is being stimulated by means of galvanic current, resulting in a sensation equal or similar to a flight illusion. The method is said to be suitable for pilot training in flight illusion. M.M.

A65-12883

CONSIDERATIONS AFTER SIX YEARS OF AERONAUTICAL APPLICATION OF RESPIRATORY AND CARDIOVASCULAR FUNCTIONAL EVALUATION TESTS [CONSIDERAZIONI DOPO SEI ANNI DI APPLICAZIONE IN AERONAUTICA DELLE PROVE DI VALUTAZIONE FUNZIONALE RESPIRATORIA E CARDIO-CIRCOLATORIA].

A. Scano (Ispettorato di Sanità Aeronautica; Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). (Congresso Internazionale di Medicina Aeronautica e Spaziale, 13th, Dublin, Ireland, Sept. 14-18, 1964.)

Rivista di Medicina Aeronautica e Spaziale, vol. 27, July-Sept. 1964, p. 318-324. In Italian.

Presentation of results of investigations on: (1) influence of step length on the amount of mechanical work by means of the treadmill ergometer (shorter and more frequent steps seem to correspond to a smaller amount of work); (2) use of the ratio between oxygen consumption and heart rate as a significant factor in evaluating cardiovascular efficiency, and calibration of this ratio on 500 pilot candidates; and (3) development of standards concerning particularly vital capacity, due to their being no longer suited to changing population characteristics. The necessity of revising the techniques currently used, and improving the interpretation of present functionality tests by means of extensive experimental work, is stressed. M.M.

A65-12884

THE CORIOLIS EFFECTS - SEARCH FOR THRESHOLD VALUES [SUL FENOMENO DI CORIOLIS - RICERCA DEI VALORI DI SOGLIA].

R. Caporale (Ispettorato di Sanità Aeronautica; Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy). Rivista di Medicina Aeronautica e Spaziale, vol. 27, July-Sept. 1964, p. 325-352. 17 refs. In Italian.

Experimental investigation of the threshold values of the Coriolis effects, not only in relation to the speed of the trailing motion, but also to the speed of the relative motion, performed on a group of subjects using a properly fitted Toennies chair. It is stated that the data obtained permitted the following determinations: (1) the Coriolis effects do not occur every time a Coriolis acceleration is present; (2) the effects seem to be brought about not only by the uniform angular speeds of the trailing and relative motions, but also by the length of the radius of the first and second motion; (3) the angular speed of the relative motion to reach the thresholds of these effects is slower, the faster the speed of the trailing motion; (4) the Schubert and Meda formulas for calculating the numerical value of the Coriolis accelerations seem to be valid (for uniform angular speed of the relative movement of the head between $10^\circ/\text{sec}$ and $500^\circ/\text{sec}$) only in the case of trailing motions of uniform angular speed between 50° and $1200^\circ/\text{sec}$; and (5) the ocular nystagmus due to the Coriolis effects, in the extension of the head, has an opposite direction to that of the trailing motion, while in the bending of the head it has the same direction as the trailing motion. M. M.

A65-12885

INFLUENCE OF HYPOXIA ON THE SUCCESS OF A SECOND HOMOLOGOUS GRAFT OF BONE MARROW IN PREVIOUSLY IRRADIATED AND GRAFTED MICE [INFLUENZA DELL' IPOSSIA SULL' ATTECCIMENTO DI UN SECONDO INNESTO DI MIDOLLO OSSEO OMOLOGO IN TOPI PRECEDENTEMENTE IRRADIATI E TRAPIANTATI].

G. Mazzella (Ispettorato di Sanità Aeronautica; Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Roma, Italy). (Congresso Internazionale di Medicina Aeronautica e Spaziale, 13th, Dublin, Ireland, Sept. 14-18, 1964.) Rivista di Medicina Aeronautica e Spaziale, vol. 27, July-Sept. 1964, p. 353-364. 9 refs. In Italian.

Experimental investigation of the degree of tolerance of a second irradiation and homologous graft of bone marrow in mice which had survived previous irradiation and grafting. After 253 days from the first experiment, irradiation with 930 r units of Co^{60} was performed in a single dose, by having two groups of mice breathe air (the control group and the group that was to receive a graft) and two other groups of mice breathe 5.6% O_2 (a control group and another to be grafted). After 150 days from the administration of the treatment, the only survivors were: (1) 40% of the control group irradiated while breathing air, (2) 0% of the re-grafted group after re-irradiation in air, (3) 100% of the mice re-irradiated while breathing 5.6% O_2 , and (4) 57% of the mice re-grafted after re-irradiation under 5.6 O_2 . The reasons for the trend of some of the data considered, besides survival, such as weight and some hematological values, are discussed. M. M.

A65-12905

RELIABILITY ANALYSIS OF LIFE-SUPPORT SYSTEMS.

R. A. Bambenek and T. R. Charanian (General American Transportation Corp., Chicago, Ill.).

Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 5-9, 1964, Paper 912G. 7 p.

Members, \$0.75; nonmembers, \$1.00.

Description of an easily performed reliability analysis of life-support systems, using estimated or generic failure rates for system components. A procedure followed to determine the effective weight penalty for life-support systems is outlined. The procedure allows a reasonably accurate comparison of the quality of different systems and yields data concerning: (1) system reliability, (2) resupply requirements, (3) instrumentation requirements, and (4) areas in need of further development. Three types of CO_2 removal systems are analyzed in detail. V. Z.

A65-12909 #

INTEGRATION ASPECTS OF THE ENVIRONMENTAL CONTROL SYSTEM FOR A LARGE SPACE STATION.

M. L. Shanken and F. R. Mastrolly (Lockheed Aircraft Corp., Lockheed-California Co., Burbank, Calif.).

Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 5-9, 1964, Paper 912C. 9 p. 8 refs.

Members, \$0.75; nonmembers, \$1.00.

Presentation of the synthesis of the environmental control system of a manned space station. The integration of the process equipment, the secondary coolant loop, and thermal control equipment into an environmental control system, and the integration of the latter with other spacecraft systems are discussed. A representative system is used to illustrate the concepts discussed. Methods of minimizing electrical power requirements are suggested. V. Z.

A65-12932 #

THE LIMITS OF MAN AND AUTOMATION IN PHOTOGRAMMETRY [DIE GRENZEN VON MENSCH UND AUTOMAT IN DER PHOTOGRAMMETRIE].

Kurt Schwidewsky (Karlsruhe, Technische Hochschule, Karlsruhe, West Germany).

Wissenschaftliche Zeitschrift, vol. 13, no. 2, 1964, p. 374-380. In German.

Comparison of the limits of man and automatic systems in photogrammetry, on the basis of an analysis of five elementary functions, with respect to which man and machine compete. These functions are: (1) optical observations, including symbol recognition and binocular vision; (2) memory capabilities; (3) ability to draw logical conclusions; (4) learning from experience and other sources; and (5) capability to deal in abstraction. The variable limits of automatic systems (variable, in terms of the continuous development of these systems) and the constant limits of man in the manipulation of numbers are compared. Five types of automatic systems, capable of solving a multitude of problems, are discussed in the order of their increasing sophistication. V. P.

A65-13099

LIFE SUPPORT SYSTEMS FOR LUNAR BASE OPERATIONS.

R. A. Fischer (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).

IN: LUNAR MISSIONS AND EXPLORATION.

Edited by C. T. Leondes and R. W. Vance. New York, John Wiley and Sons, Inc., 1964, p. 452-497. 15 refs.

Discussion of four life support subsystems to be considered in the overall process of supporting man and his activities in lunar base operations. It is stated that the life support systems currently being developed for the Apollo and Gemini programs will be adequate for early lunar missions. The principal differences will be in: (1) heat rejection, and (2) protection from lunar surface and solar radiation. Advanced life-support system concepts currently in the research and development stages will make longer missions possible through the use of waste regeneration processes. These advanced systems will probably be available before the first lunar landings are made. Based on estimates and current life support system technology, a table shows some of the recommended environmental control system elements for various mission durations up to 3000 hr. An estimated plot of system weight vs mission duration is shown. The type of system varies with duration. It is stated that an attempt was made to optimize weight through greater use of regenerative processes as the mission duration increased. M. M.

A65-13171

PURINE AND PYRIMIDINES IN SEDIMENTS FROM THE EXPERIMENTAL MOHOLE.

Eugene Rosenberg (California, University, Dept. of Bacteriology, Los Angeles, Calif.).

Science, vol. 146, Dec. 25, 1964, p. 1680, 1681. 12 refs. Grant No. NsG-672.

Detection of cytosine, adenine, guanine, and thymine (but not uracil) in core samples taken from various depths of the experimental Mohole. The following quantities of bases were found in the deepest core samples available (approximately 25×10^6 yr

old); cytosine, 2.5 μg ; adenine, 0.9 $\mu\text{g}/5\text{ g}$; guanine, 0.2 $\mu\text{g}/5\text{ g}$; thymine and uracil, 0 $\mu\text{g}/5\text{ g}$. (Author) W.M.R.

A65-13397 #

EFFECT OF PROLONGED WEIGHTLESSNESS ON THE FUNCTIONING OF THE MYOCARDIUM AUTOMATISM [O VLIHANII DLITEL'NOI NEVESOMOSTI NA FUNKTSIU AVTOMATIZMA SERDECHNOI MYSHTSY].

R. M. Baevskii and K. I. Zhukov.

Kosmicheskie Issledovaniia, vol. 2, Nov.-Dec. 1964, p. 936-938. In Russian.

Statistical analysis of the dynamic sequence of RR-electrocardiogram intervals, showing that the functioning of the myocardium automatism exhibits characteristic changes in conditions of prolonged weightlessness. These changes are associated with the amplification of the vagus-nerve tonus as a result of the adaptation of the blood circulation system to the changed conditions. It is concluded that instability of the cardiac rhythm in orbital flight conditions is one of the regular physiologic reactions resulting from zero-g effects. V. P.

A65-13398 #

COMBINED EFFECT OF LOW-FREQUENCY VIBRATION AND X-RAYS UPON THE MEDULLA OSSUM CELLS OF MAMMALS [KOMBINIROVANNOE DEISTVIE NIZKOCHESTOTNOI VIBRATSII I RENTGENOVSKIKH LUCHEI NA KLETKI KOSTNOGO MOZGA MLEKOPITAIUSHCHIKH].

Iu. S. Demin.

Kosmicheskie Issledovaniia, vol. 2, Nov.-Dec. 1964, p. 939-945. 24 refs. In Russian.

Investigation of the frequency of deranged mitoses in the medulla ossium of mice after exposure to a dose of 50 roentgen of X-radiation, to vertical vibration at a frequency of 70 cps, and to the combined effect of vibration and irradiation. It is found that vibration tends to increase the frequency of the deranged mitoses, resulting primarily from the adhesion frequency of chromosomes. Exposure to vibration prior to irradiation does not increase the frequency of deranged mitoses compared to the frequency of derangements resulting from irradiation without vibration. However, there are some differences in the spectrum of the deranged mitoses: a certain decrease in frequency of the chromosome rearrangements and an increase in adhesion frequency resulting from the combined effect of vibration and irradiation. V. P.

A65-13421 #

FEASIBILITY OF A WEARABLE EXOSKELETAL STRUCTURE.

Neil J. Mizen (Cornell Aeronautical Laboratory, Inc., Transportation Research Dept., Buffalo, N.Y.).

American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 29-Dec. 4, 1964, Paper 64-WA/HUF-3, 11 p. 6 refs.

Members, \$0.50; nonmembers, \$1.00.

Contracts No. AF 18(600)-1922; No. Nonr-3830(00).

Description of tests with a nonpowered, wearable, exoskeletal device which follows the basic movements of the wearer, in order to determine the feasibility of using such a device. Experiments to determine the limitations imposed by restricting the allowable range of motion of given joints are discussed. The velocity and acceleration of each joint during the performance of certain tasks are determined. The results of the tests confirm the feasibility of the concept. P.K.

A65-13422 #

SOME BIO-ENERGETIC CONSIDERATIONS OF SPACE FLIGHT AND THEIR IMPLICATIONS TO SYSTEM DESIGNERS.

I. Streimer (North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.).

American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 29-Dec. 4, 1964, Paper 64-WA/HUF-2, 5 p. 37 refs.

Members, \$0.50; nonmembers, \$1.00.

Discussion of experimental work on the efficiency of, and requirements for, workers performing in reduced-traction and/or pressure-suited environments. The losses in efficiency due to the effects of reduced traction, to the effects of the space suit on worker mobility and output, and to the deleterious effects of prolonged weightlessness are examined. The results are considered

in terms of their applicability to certain aspects of system design and sizing for manned spacecraft. P. K.

A65-13527 #

HUMAN FACTORS RESEARCH.

K. F. Thomson (U.S. Naval Training Device Center, Human Factors Laboratory, Sands Point, Port Washington, N.Y.).

Naval Research Reviews, vol. 17, Nov. 1964, p. 15-21.

Identification and description of some of the more important areas of research, and discussion of the role of simulation in training device design. In effecting simulation, more complete and sophisticated knowledge of how the real world behaves must be obtained, and more and better data must be produced from the manipulation of the properties of the models to learn how to provide the simplest and most useful approximation of the world to suit the economics of the situation at hand. Laboratory facilities are described, and five current projects in flight simulation are discussed. Transfer of training, conceived of as the change in performance on one task as a result of practice upon another, and training for tactical decision making are given attention. F. R. L.

A65-13547

MODIFIED PHYCOERYTHRIN FROM PORPHYRIDIUM CRUENTUM TREATED WITH P-CHLORO-MERCURIBENZOATE.

Eiji Fujimori (USAF, Office of Aerospace Research, Cambridge Research Laboratories, Space Physics Laboratory, Energetics Branch, Photobiology Section, Bedford, Mass.).

Nature, vol. 204, Dec. 12, 1964, p. 1091-1093. 11 refs.

Separation of a modified component of phycoerythrin from *Porphyridium cruentum* saturated with p-chloro-mercuribenzoate (PCMB). An interaction of this component with glutathione is also reported. The existence of two main units in phycoerythrin is indicated: one contains the 500-m μ chromophore and the other contains both the 545- and the 565-m μ chromophores. In the latter fluorescent segment, SH groups of protein react with the 565-m μ chromophore. Further investigations of possible subunit structure are in progress. W.M.R.

A65-13764

RADIATION HAZARDS IN SPACE.

David L. Dye and Maurice Wilkinson (Boeing Co., Seattle, Wash.). *Science*, vol. 147, Jan 1, 1965, p. 19-25. 22 refs.

Investigation of the body-point dosages of radiation - particularly those due to solar flares - to which an astronaut would be subjected under different shielding conditions. Expressions are given for shielding and dose calculation, and the probability per week of the occurrence of a solar flare that produces an energetic proton flux near the Earth is graphed. Doses in rads proton⁻¹ cm⁻² for the eye, the sternum, the chest skin, the spleen, and the gut are tabulated and graphed for conditions of no shielding and of 1, 2, 4, and 8 gm/cm² shielding. Radiation characteristics of the belts of trapped radiation and of the primary cosmic rays are also discussed briefly. Criteria for planning a space mission to minimize radiation hazard are outlined. D.H.

A65-13854 #

THE ARTICULATED CENTRIFUGE FOR ACCELERATION STUDIES.

Michael Brian (Space/Defense Corp., Design Section, Birmingham, Mich.).

American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 29-Dec. 4, 1964, Paper 64-WA/HUF-7, 11 p. 6 refs.

Members, \$0.50; nonmembers, \$1.00.

Research supported by General Motors Corp.

Discussion of the development of the model version of the articulating centrifuge and of some preliminary results using squirrel monkeys as the test subjects. The articulating centrifuge presents a design concept for generating G-time profiles with variable onset-dwell-decay rates. The motive-power requirements are minimal and originate only from the need to counteract aerodynamic drag and some friction within the system. The presented small model, in addition to proving the concept, is a fully usable research tool for testing organisms or physical components. The discussion covers the design approach and description, balance and disturbing accelerations, instrumentation, operating problems, and research applications. M.L.

LC ENTRIES

A65-80149

CONTRIBUTION TO THE PROBLEM OF FAT EMBOLISM IN FATAL DECOMPRESSION SICKNESS [BEITRAG ZUR FRAGE DER FETTEM-BOLIE BEI TODLICHER DRUCKFALLKRANKHEIT].

H. Fischer (Sanitätsschule der Bundeswehr, Munich, Germany). *Monatsschrift für Unfallheilkunde, Versicherungs-, Versorgungs- und Verkehrsmedizin*, vol. 66, Aug. 1963, p. 318-322. 28 refs. In German.

A 23-year-old aviation cadet crashed in a field during performance of a normal flight maneuver up to 19 000 ft. altitude on his third solo flight in a T-33 aircraft. Histological examination of recovered fragments of internal organs and the spinal cord revealed fat emboli in the vessels and cells of the lungs, liver, and kidney. Bone fractures as the cause of fat embolism were considered unlikely due to the instantaneous, explosive destruction of the aircraft and the pilot. Injury in flight, collision in mid-air, burns, and post-mortem intravascular fat displacement in the process of decomposition were also ruled out. Pathology suggests decompression sickness (or explosive decompression), which, has been reported only at altitudes exceeding 7500 m. Nevertheless, considering the faulty pressurization system of the T-33 aircraft, that often lowers the cabin pressure 1000 to 2000 ft. above the ambient altitude, decompression sickness is viewed as a distinct possibility. The author also points out the frequency with which an open foramen ovale is found in cases of fatal decompression sickness and the possible role of this anomaly in accelerating the ascent of gas and fat emboli to the brain.

A65-80150

PHYSIOLOGICAL RESPONSES OF ANIMALS DURING FLIGHT ON BOARD OF THE THIRD, FOURTH AND FIFTH SPUTNIKS [FIZIOLOGICHESKIE REAKTSII ZHIVOTNYKH PRI POLETAKH NA TRET'EM, CHETVERT I PIATOM KOSMICHESKIKH KORABLIKH-SPUTNI-KAKH].

O. G. Gazonko, I. I. Kas'ian, A. R. Kotovskaya, E. M. Iuganov, and V. I. Iazdovskii. *Izvestia Akademii Nauk SSSR, Seriya Biologicheskaya*, no. 4, Jul.-Aug. 1964, p. 497-511. 19 refs. In Russian.

Experimental data pertaining to the orbital flights of the dogs Pchelka, Mushka, Chernushka, and Zvezdochka are summarized. It was found that variations from normal physiological functions were most pronounced during takeoff and reentry of the space vehicles. Cardiovascular values returned to normal in most of the dogs during the extended periods of weightlessness. Respiratory frequency both increased and decreased in the animals.

A65-80151

WHY DO CERTAIN VISUAL TASKS DIMINISH THE SUBJECTIVE OPTICAL FLICKER FUSION FREQUENCY [POURQUOI CERTAINES TACHES VISUELLES ABAISSENT-ELLES LA FREQUENCE DE FUSION OPTIQUE SUBJECTIVE?]

P. Rey and J.-P. Rey (Genève U., Inst. of Physiol., Lab. of Work Physiol., Switzerland). *Travail Humain*, vol. 27, Jul.-Dec. 1964, p. 293-304. 8 refs. In French.

Subjects were exposed to various tasks to produce the lowering of the subjective optical fusion frequency (C.F.F.) that is sometimes observed after work. The five tasks of the first series were similar to Bourdon's test, and all involved a significant fall of the C.F.F. except the one that did not expose the eye to repeated signals. In the second series of tasks, mental operations added to the simple observation of words passing in front of the eyes did not, by themselves, affect the subject's C.F.F. The fall of C.F.F. depended only on the speed of the passing letters. An auditory task similar to the complexity of the visual tasks did not produce modification of the C.F.F. greater than that observed in subjects at rest. In a further experiment, letters were replaced by a succession of dark and light surfaces of the same size. The fall of C.F.F. as a function of the stimulation frequency followed a U-curve. It is concluded that the effect of stimulation by letters or intermittent signals of the C.F.F. can be compared to that produced by the flickering light of a stroboscope. The decrease of C.F.F. observed during the execution of certain tasks may be due to this stimulation, making it unnecessary to invoke a fatigue phenomenon to explain it.

A65-80152

THE EFFECT OF ACOUSTIC WAVES ON THE PACINIAN CORPUSCLE: A PRESSURE-SENSORY RECEPTOR OF THE SKIN. Eugene Agalides (Gen. Dyn./Electron., Res. Dept., Biophys. Communications Lab., Rochester, N.Y.)

Transactions of the New York Academy of Sciences, vol. 26, Aug. 1964, p. 670-687. 12 refs. Contract AF 49(638)-1185.

Experiments to record responses of the Pacinian corpuscle exposed to acoustic wave stimuli are described. The Pacinian corpuscle used were obtained from the small intestine and mesentery of cats. The preparation and mounting of these corpuscles, together with the acoustical stimulator and recording procedure used are also described. It was determined that mechanical stimulation of the pressure sensitive receptor (Pacinian corpuscle) can be affected by acoustic waves. It was further observed that no coupling took place between the sensory receptor and stimulator. Since Pacinian corpuscles also occur in the skin, the author discusses possible similar effects of acoustic stimulation of the outer integument.

A65-80153

THE WEARING OF CONTACT LENSES IN TRAINED PILOTS [DAS TRAGEN VON AUGENHAFTSCHALEN BEI AUSGEBILDETEN FLIEGERN].

I. Lehwess-Litzmann (Inst. für Luftfahrtmed., Berlin, Germany). *Das Deutsche Gesundheitswesen*, vol. 19, Sep. 17, 1964, p. 1781-1786. 23 refs. In German.

A report is presented on the feasibility of contact lenses for trained pilots with decreasing visual acuity. Tolerance to corneal contact lenses was explored in conditions of simulated altitude and in actual flight. In addition, the hard plastic corneal lens was compared with the recently developed gel-lens of polyglycolmonomethacryl under simulated altitude conditions. Gel-lenses adhered better and were better tolerated. Porosity of the hydrophilic gel prevents formation of bubbles under the lens at high altitude. Optical quality of the new gel-lens could not be evaluated at this time. The basic requirements for use of contact lenses in aviation are: (1) a minimum tolerance time of 7 to 8 hours, (2) ease and safety of insertion, and (3) no impairment of visual acuity under altitude stress. At present, contact lens wear is limited to the older fully trained aviator. Applicants should still be required to have normal visual acuity in both eyes at the beginning of flight training.

A65-80154

THE INFLUENCE OF HYPOXIC HYPOXEMIA ON G.O.T. AND L.D.H. ACTIVITY OF THE MYOCARDIUM OF RATS.

Th. W. Donkerlo (Utrecht U., Lab. for Physiol. Chem., The Netherlands). *ACTA Physiologica et Pharmacologica Neerlandica*, vol. 12, 1963, p. 520-524. 10 refs.

Hypoxic hypoxemia in rats had no influence on the activity of glutamic-oxalacetic-transaminase (GOT) and lactic dehydrogenase or the pyridoxal phosphate content of the myocardium. This is in contradiction to the decrease of GOT activity in myocardial tissue found by other authors under similar conditions. It is possible that the cause of the divergent results might be found in the different strains of rats used.

A65-80155

EVOKED RESPONSES FROM THE EYE AND VISUAL PATHWAYS IN THE HYPOTHERMIC CAT.

L. C. Massopust, Jr., L. R. Wokin, M. S. Albin, and J. Meder (Cleveland Psychiat. Inst., Lab. of Neurophysiol., Ohio; and Cleveland Metropol. Gen. Hosp., Western Reserve U. School of Med., Dept. of Surg., Ohio). *Experimental Neurology*, vol. 10, Nov. 1964, p. 383-392. 18 refs. Grants No. NIH-G-NB-04393-02 and NIH-G-M-05756-02.

During induced hypothermia in cats the amplitudes of the electroretinogram (ERG) a- and b-waves decreased almost linearly until they disappeared. However, there was not a one-to-one relationship between the amplitude of the ERG components and the evoked potentials recorded from the optic chiasm, superior colliculus, or the optic cortices during cooling. When the ERG disappeared at about 25° C esophageal temperature, high amplitude responses were observed in the central nervous system. Decreases in amplitudes and increases in latencies of the evoked responses of the retina, central visual pathway, and optic cortex appeared to be due to the direct effect of cold on the reactivity and conduction velocity of neurochemical systems. The latencies and amplitudes of the evoked responses of the visual system, however, appeared to be differently affected by hypothermia; the changes in latency among the various areas of the visual system were much less variable than the changes in amplitude. The phenomena were reversible, within the range of temperatures employed. Amplitudes and latencies of evoked responses throughout the visual system returned to normal as the subjects were rewarmed.

A65-80156

HEAD, EYE, BODY, AND LIMB MOVEMENTS FROM SEMICIRCULAR CANAL NERVES.

Jun-ichi Suzuki and Bernard Cohen (Mount Sinai Hosp., Dept. of Neurol., New York, N.Y.) *Experimental Neurology*, vol. 10, Nov. 1964, p. 393-405. 26 refs. Grant No. NIH-G-NB-00294.

Electric stimulation of single ampullary nerves in alert cats and monkeys produced rapid stereotyped head movements. These head movements were similar in the cat and monkey and appeared to be in a plane parallel to the plane of the canal whose nerve was stimulated. Body and limb responses also were evoked. They were more pronounced in the cat than in the monkey and consisted of varying degrees of ipsilateral forelimb extension, contralateral forelimb flexion, curvature of the trunk, and contralateral circling. By stimulating canals singly or in combination, head movements could be produced in any spatial plane. These findings demonstrate the specific nature of the reflex head and postural movements produced by the semicircular canals in these animals.

A65-80157

MUSCLE TONUS IN HUMAN SUBJECTS DURING SLEEP AND DREAMING.

A. Jacobson, A. Kales, D. Lehmann, and F. S. Hoedemaker (Calif. U., Neuropsychiat. and Brain Res. Inst., Dept. of Anat., Los Angeles). *Experimental Neurology*, vol. 10, Nov. 1964, p. 418-424. 8 refs.

It was demonstrated previously that dreams occur during EEG sleep-stage I, rapid eye movement periods, and that simultaneously the tonus of some neck muscles decreases. To determine the activity of other somatic muscle groups, the tonic electrical activity of 29 muscle areas was recorded from cutaneous bipolar electrodes on sleeping human subjects. The electroencephalogram and the eye movements were recorded simultaneously. Tonus of most head and neck muscles studied decreased with the onset of EEG stage I, rapid eye movement sleep. Yet, trunk and limb muscles exhibited stable levels of tonic activity throughout the night with no change of level associated with rapid eye movement periods.

A65-80158

MOTOR REACTIONS IN WEIGHTLESSNESS (DVIKATEL'NYE REAKTSII V USLOVIAKH NEVESOMOSTI).

I. I. Kas'tan, V. I. Kopanov, and E. M. Iuganov. *Izvestiia Akademii Nauk SSSR, Seriya Biologicheskaya*, no. 5, Sep.-Oct. 1964, p. 677-689. 116 refs. In Russian.

The literature and experimental data on the effects of simulated weightlessness and space flight on motor activity are reviewed. Motor disturbances were found to be minimal if the subject was at his working place in an immobilized position. If restraints were removed, the subjects could perform limited and elementary work tasks only. Repeated exposures to weightlessness resulted in a decrease of motor disturbances. The direct and indirect physiological mechanisms involved in the effects of weightlessness on the human organism are discussed.

A65-80159

A COMPARATIVE EVALUATION OF THE ACTION OF DEPRESSANT AND STIMULANT DRUGS ON HUMAN PERFORMANCE.

B. Blum, M. H. Stern, and K. I. Melville (McGill U., Depts. of Pharmacol. and Psychol., Montreal, Canada). *Psychopharmacologia*, vol. 6, 1964, p. 173-177. 14 refs.

The effects of orally administered alcohol (10 to 20 cm³), alcohol (10 cm³) together with distraction, of pentobarbital (150 mg), of amphetamine (7.5 mg), and of caffeine (100 and 200 mg) were studied on performance of motor and intellectual tasks by intelligent human subjects. Pentobarbital depressed all of these tests, whereas the other drugs showed differential actions: alcohol prominently increased errors in the addition test at doses not affecting other intellectual tasks or motor performance. Amphetamine and caffeine decreased errors on mental tasks while not affecting motor tasks. Distraction acted in these individuals as a stimulant, decreasing errors apparently by raising the level of alertness, and it also counteracted the deleterious effects of alcohol on these tasks.

A65-80160

COMPOUND 84/F 1983 COMPARED WITH D-AMPHETAMINE AND PLACEBO IN REGARD TO EFFECTS ON HUMAN PERFORMANCE.

Audrey R. Holliday, Richard B. Morris, and Robert P. Sharpley (Wash. U., Dept. of Pharmacol., Seattle). *Psychopharmacologia*, vol. 6, 1964, p. 192-200. 7 refs. Wander Res. Inst. supported research. Grant No. PHS-G-MY-3311.

This study establishes that ingestion of either 30 mg or 60 mg of 84/F 1983 [4'-methyl-2-(1-pyrrolidinyl) valerophenone hydrochloride, Chem. Abs.; or 1-p-tolyl-1-oxo-2-pyrrolidino-n-pentan-HCl, Stille et al. (1963)] by moderately fatigued normal humans will significantly arrest the decrement in performance over time on a simple mental task shown by placebo subjects. While the mean scores of subjects ingesting either dose of 84/F 1983 were generally higher than the mean scores of subjects ingesting 10 mg of d-amphetamine, no statistically significant difference was found between these 3 drug groups with the exception that the 60 mg 84/F 1983 group showed a significantly higher mean

performance than the 30 mg 84/F 1983 group by the end of 1 hour post drug. Under conditions of this study, 84/F 1983 appears to be a highly effective psychostimulant that resembles d-amphetamine in its enhancing effect on human performance. The replication of this method for discriminating between the effects of stimulants and a placebo on human performance of a simple mental task shows the method to be highly reliable.

A65-80161

DEXTRO-AMPHETAMINE, ETHANOL AND DEXTRO-AMPHETAMINE-ETHANOL COMBINATIONS ON PERFORMANCE OF HUMAN SUBJECTS STRESSED WITH DELAYED AUDITORY FEEDBACK (DAF).

Francis W. Hughes and Robert B. Forney (Ind. U., School of Med., Dept. of Pharmacol. and Toxicol., Indianapolis). *Psychopharmacologia*, vol. 6, 1964, p. 234-238. 8 refs. Grant No. PHS-G-AC-20.

A delayed audiofeedback (DAF) system used to induce a stressful situation in eight human subjects and their performance in verbal and arithmetical tests was quantified under the influence of d-amphetamine and/or ethanol. Ethanol decreased performance. Dextroamphetamine had relatively no effect, and, when given in combination with ethanol, no clear evidence of antagonism of ethanol was demonstrable.

A65-80162

MODIFICATION OF RADIATION DAMAGE BY FRACTIONATION OF THE DOSE, ANOXIA, AND CHEMICAL PROTECTORS IN RELATION TO LET. G. W. Barendsen (Organ. for Health Res. T.N.O., Radiobiol. Inst., Rijswijk, The Netherlands).

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 96-114. 15 refs.

In this paper a number of experiments are described on the relation between physical properties of different radiations and the possibility of modifying the radiation response of cultured human cells by various experimental conditions, using the capacity for clone formation as a criteria. Dose-survival curves are presented for various types of radiation, α -particles, deuterons, X- and γ -rays, and beta-particles, and the relation between the relative biological effectiveness and the linear energy transfer is discussed and shown to be dependent on the level of damage considered. Experiments are described concerning the effects of fractionation of the dose. It was found that repair of sublethal damage occurs after irradiation with 250 kV X-rays, but is absent after irradiation with α -particles from ²¹⁰Po. The same differences were observed with cells equilibrated with nitrogen during irradiations. Furthermore with single exposures, equilibration of the cells with nitrogen has a pronounced effect on damage produced by 250 kV X-rays, whereas only a small protective effect is observed with ²¹⁰Po α -particles. The same differences between effects of 250 kV X-rays and X-radiation were found with regard to the protective action of cysteamine. With 250 kV X-rays, dose-reduction factor of 3.7 was obtained at concentration of 25 mM cysteamine, whereas with α -particles from ²¹⁰Po a factor of 1.2 was found. The results are discussed in terms of differences in the spatial distributions of the ionizations produced by the different radiations.

A65-80163

RECOVERY FROM RADIATION INJURY IN MAMMALS.

John B. Storer (Roscoe B. Jackson Mem. Lab., Bar Harbor, Me.) *Annals of the New York Academy of Sciences*, vol. 114, Mar. 31, 1964, p. 126-137. 31 refs.

Contract AT(30-1)-2313 and Grant No. PHS-G-RH-71.

A discussion is presented of the problem of estimating mammalian recovery rates after radiation injury, and is limited to studies in which injury leading to death is evaluated. The method of exposing the organism to sublethal doses of radiation at various time periods and then measuring mortality (split-dose recovery estimates) is discussed in light of previous studies, and criticisms are made. Studies in body weight changes and the impulse lethality function are discussed and it appears that these may show the extent of injury and recovery. Dose size, quality of radiation, species differences, recovery rate equations, aging, and residual damage are other areas of study analyzed. Suggestions are made for further work in evaluating recovery.

A65-80164

SOME OBSERVATIONS AND AN HYPOTHESIS CONCERNING THE EARLY STAGES OF RADIATION RECOVERY.

Robert F. Kallman and Giovanni Silini (Stanford U. Med. School, Palo Alto, Calif.)

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 173-184. 23 refs.

Grants No. PHS-G-C-3353 and PHS-G-CRT-5008.

Data are presented relating to the fluctuations in radiosensitivity, as determined by the acute LD₅₀, of two inbred strains of mice within the four days following conditioning whole-body irradiation. The kinetics

of this recuperative process are typified by an initial minimum in radio-sensitivity, succeeded by a rise to a maximum, terminating in a progressive return to the preirradiation level. A review of the relevant literature reveals the same kind of kinetics in other systems. It is therefore suggested that this is a general phenomenon applicable to the effects of divided doses of radiation on mammalian cell reproductive integrity. A hypothesis is proposed to account for these recuperation kinetics, based largely upon the evidence for generation phase-dependent radio-sensitivity differences in division delay and survival of cell reproductive integrity.

A65-80165

THE DIAGNOSIS, TREATMENT, AND PROGNOSIS OF HUMAN RADIATION INJURY FROM WHOLE-BODY EXPOSURE.

Eugene P. Cronkite (Brookhaven Natl. Lab., Med. Res. Center, Upton, Long Island, N.Y.)

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 341-355. AEC supported research.

A report is given of the author's view of the diagnosis, treatment, and prognosis of human injury from whole-body irradiation. Diagnosis is from a clinical viewpoint where the dosimetric data are not known. Hematological changes are the primary means of detection while the excretion of beta aminoisobutyric acid is a possible way of detecting damage. A therapeutic outline is given presenting methods and philosophy of treatment. This includes hospital procedures, monitoring electrolyte balance, antibiotic therapy, use of blood transfusions, and examination of patient. Transfusions of bone marrow are discussed and the probability of developing leukemia after recovery is analyzed. A panel discussion of the paper is included.

A65-80166

SEQUENTIAL MANIFESTATIONS OF ACUTE RADIATION INJURY VS. "ACUTE RADIATION SYNDROME" STEREOTYPE.

M. Ingram, J. W. Howland, and C. H. Hansen, Jr. (Rochester U. Med. Center, N.Y.)

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 356-360; discussion, p. 360-367. 11 refs.

Aspects of the acute radiation injury problem are discussed, particularly as related to accidental X-ray exposures received by nine civilian radar technicians working at an Air Force radar station in Lockport, New York, in March 1960. The exposed men were engaged in a trouble-shooting operation on a newly installed klystron tube, that serves as a voltage amplifier for the radar transmitter, and failed to function properly when voltage was applied. The most seriously injured men worked close to the tube, sometimes at its face, one of the men sustaining a small thermal burn on one arm where it touched the hot tube. The less seriously exposed men looked on for only a few minutes. Present best estimates of exposure dose for the most seriously injured man are approximately 300 r to the trunk and at least 1,500 r to the head. The casualty in question showed a series of clinical changes, referable to the central nervous system, vascular system, gastrointestinal system, hematopoietic system, skin, eyes, and testes. Treatment of radiation injury under conditions of civilian disaster or military combat call for the use of different diagnostic criteria, different therapeutic measures, different attitudes, different facilities, and supplies.

A65-80167

TREATMENT OF ACUTE TOTAL-BODY IRRADIATION INJURY IN MAN.

G. Mathe, J. L. Amiel, and L. Schwarzenberg (Assoc. Claude-Bernard, Centre de Rech. Cancérologiques et Radiopathol., Hop. Saint-Louis, Paris, France; and Inst. Gustave-Roussy, Serv. d'Hématol., Villejuif, Seine, France).

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 368-392. 20 refs. Work supported by Comm. A l'Energie Atomique, Centre d'Etudes Nucl. de Fontenay-aux-Roses, Contract No. 4.461/R; and Communauté Européenne de l'Energie Atomique and Agence de l'Energie Atomique de Vienne, Contract No. 93 I/RB.

A discussion is presented on various aspects of treatment for acute total-body irradiation injury in man. A review of some of the acute and lethal effects on the blood cells and hematopoietic system are given. The treatment of radiation injury is essentially based on a very intensive symptomatic therapy (maintenance of patients in aseptic conditions, rational use of antibiotics, platelet transfusions when cell level is below 50,000; allogenic bone-marrow transfusion is indicated in case of failure of this symptomatic therapy, whether the dose of irradiation is 100% lethal or less. A plan for a hospital-type ward for treatment of irradiation cases is shown with emphasis on aseptic conditions.

A65-80168

SOME REMARKS ON THE PHARMACOLOGY OF RADIOPROTECTANT AGENTS.

Victor Distefano (Rochester U. School of Med. and Dentistry, Dept. of Pharmacol., N.Y.)

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 588-596. 45 refs.

A striking parallelism between pharmacological activity and radiation protection has been clearly demonstrated for serotonin, epinephrine, histamine, p-aminopropiophenone, and cyanide. This correlation permits the assignment of hypoxia as the probable mechanism whereby these agents protect against the effects of radiation. On the other hand, (AET) aminoethylisothiuronium bromide, although very active pharmacologically, probably exerts its radioprotective activity by means other than the production of hypoxia. The greatest limitation to the use of existing radioprotectants in man and higher animals is their toxicity. The task of the pharmacologist is clear. Methods for attenuating the toxicity of the present effective compounds must be sought and new nontoxic agents must be devised utilizing established principles of radiation protection.

A65-80169

STUDIES CONCERNING THE NATURE OF THE PROTEIN-BOUND PROTECTIVE AGENT IN THE TISSUES OF MICE GIVEN BIS(2-GUANIDOETHYL) DISULFIDE (GED).

George Kollmann, Bernard Shapiro, and Emanuel E. Schwartz (Albert Einstein Med. Center, Southern Div., Dept. of Radiol., Res. Labs., Philadelphia, Pa.)

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 602-606. 5 refs. USAF supported research.

An attempt is made to determine qualitatively and quantitatively the presence of disulfide and thiolester bonds between the protective agent and the protein tissue in radiation-protected mice. Mice treated with bis(2-guanidoethyl) disulfide (GED) were sacrificed, and their tissues chemically analyzed for the presence of the mixed disulfide bond or the thiolester bond in various tissue homogenates. It was found that there was more thiolester-bound S³⁵ than disulfide-bound S³⁵ except in the testis. Tentative conclusions are made as to the greater importance of either of these bonds, and it is speculated that the thiolester bond protects protein from decarboxylation during irradiation.

A65-80170

PROTECTIVE EFFECT OF AET ON THE IMMUNE MECHANISM OF X-IRRADIATED MICE.

Eric L. Simmons and Odette Lartigue (Chicago U., Dept. of Med.; and Argonne Cancer Res. Hosp., Ill.)

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 607-613. 7 refs.

Groups of CF₁ female mice were X-irradiated with dosages ranging from 300 to 900 r, with or without S₂-aminoethylisothiuronium (AET) given intraperitoneally or orally before exposure. They were then challenged either 24 hours or 7 days later with spleen cells from leukemic DBA/2 mice. In one set of experiments the groups were given a weak challenge of only 100 cells per mouse. In other experiments each group received a strong challenge of 50 × 10⁶ cells per mouse. Results indicate that AET enhanced the ability of the immune mechanism to successfully reject the invasion of leukemoid cells, despite the irradiation doses administered. AET was more effective when given intraperitoneally than orally. With both modes of administration, the dose-reduction factors for leukemic deaths were comparable to the dose-reduction factors obtained from mortality curves of AET-protected mice not challenged with leukemia.

A65-80171

RECOVERY RATE AND DOSE-REDUCTION FACTOR IN CYSTEAMINE-TREATED MICE AFTER FRACTIONED IRRADIATION.

Arne Nelson, Ola Hertzberg, and Inga-Britt Henricsson (Res. Inst. of Natl. Defence, Forsvarets Forskningsanstalt, Div. of Radiobiol., Sundbyberg, Sweden).

Annals of the New York Academy of Sciences, vol. 114, Mar. 31, 1964, p. 630-650. 10 refs.

In order to investigate the protective effect of cysteamine at sublethal doses of irradiation, groups of mice were exposed to the following fraction doses: 80, 160, 320 r at time-intervals of one, three, and seven days. The total doses were chosen to give lethality rates from 0 to 100%. Half of the animals were given cysteamine before each irradiation. A simple mathematical model was used that fitted the result regarding short-term lethal effects. The effect of cysteamine appeared to be a dose-reduction effect and not an enhancement of the recovery. The dose-reduction factor seems to be of the same order of magnitude at sublethal as at lethal doses.

A65-80172

AUDITORY THRESHOLD IN RECRUITS BEFORE AND AFTER THE FIRING OF WEAPONS [L'AUDITION CHEZ LES RECRUES AVANT ET APRES DES TIRS PAR ARMES A FEU].

Borje Drettner.

Revue Internationale des Services de Santé des Armées de Terre de Mer et de l'Air, vol. 37, Jul.-Aug. 1964, p. 511-512. In French.

Pure-tone audiometric measurements were made on 136 recruits from an infantry regiment and on 99 recruits from an antiaircraft regiment before and after firing with different weapons. After the firing, a temporary threshold shift (TTS) up to or exceeding 10 dB for some frequencies was found in 13% of the recruits. TTS chiefly concerned the frequencies 4000 to 8000 cps. Ears with previous hearing loss showed a TTS considerably more often than normal ears. This difference may be at least partly due to the technical factor, since a reduction in a previously normal ear could not be detected if the hearing threshold did not attain the level of 30 dB, the lowest hearing thresholds at which a reduction of 10 dB could be established, when the screening audiometry before firing was performed at a level of 20 dB. When ear protectors were used a TTS of 6% occurred, while in those men who did not use them this figure was 17%. The difference is statistically significant, and the two groups showed no differences with regard to the time interval between the end of the firing and the subsequent audiometry.

A65-80173

A REFINED METHOD OF DETERMINING THE DEGREE OF COMFORT OF CHAIRS [EINE VERFEINERTE METHODE ZUR BESTIMMUNG DES KOMFORTGRADES VON SITZEN].

R. Coermann and A. Rieck (Max Planck-Inst. für Arbeitsphysiol., Dortmund, Germany).

Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 20, 1964, p. 378-397. 10 refs. In German.

A refined method to measure seat comfort was developed, based on experiments carried out by E. M. Grandjean (Internationale Zeitschrift für angewandte Physiologie, vol. 18, 1960, p. 101-106), recording intensity and frequency of involuntary movements in sitting subjects. Intensity was expressed in terms of displacement of point of gravity brought about by positional changes of the experimental subjects. Frequency and intensity of movements per 10 kilopond (kp) of the subjects' weight were considered in the overall evaluation. To determine agreement of objective and subjective findings, the subjects were asked to fill out a questionnaire after sitting periods of 15 minutes and 2 hours, to express their judgment regarding the chair tested from 12 different points of view. The results show agreement between subjective and objective findings in the case of distinct differences in sitting comfort. When the differences were minor, neither the opinions expressed by the subjects nor the results of the measurements recorded were significant. But even in the latter case, the measurements are meaningful, if a large group of test subjects are employed and testing conditions are uniform.

A65-80174

TRANSMISSION OF VIBRATION ON MAN AT DIFFERENT ANGULAR SETTINGS OF THE BACK OF A CHAIR [ÜBERTRAGUNG VON ERSCHÜTTERUNGEN AUF DEN MENSCHEN BEI VERSCHIEDENEN ANSTELLWINKELN DER RÜCKENLEHNE].

R. Coermann and A. Okada (Max Planck-Inst. für Arbeitsphysiol., Dortmund, Germany).

Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 20, 1964, p. 398-411. In German.

To determine the effect of inclination of seat backrests on transmission of vibrations on the human body, the mechanical impedance of 5 subjects was measured at backrest angles of 90° to 140°, at frequencies from 1 to 13 cps. Simultaneously, vibration increments on head and shoulder of the experimental subjects were recorded. From the results the transmission factor of vibrations from the vibrating platform to the shoulder and/or head was calculated. The chairs had no upholstery. The curves show consistently resonance peaks between 5 and 6 cps. The backrest angle has little bearing on impedance, i.e., relative displacements of effective body masses are generally independent of the backrest angle. However, head and particularly shoulder amplitudes show a distinct maximum at 100° to 105°, but decrease below 90° values at angles exceeding 120°. For obvious reasons of driving efficiency, greater seat inclinations are applicable only in the passenger section of the vehicle. Extension of this investigation to upholstered seats appears necessary before final conclusions regarding optimal seat design can be drawn.

A65-80175

RENAL HEMODYNAMICS: EFFECT OF GRAVITY ON SODIUM AND WATER EXCRETION.

William M. Stahl (Vt. U., Coll. of Med., Surg. Res. Labs., Burlington). Surgical Forum, vol. 15, 1964, p. 13-14.

The effects of gravity and subgravity were studied in 15 water and sodium loaded dogs using the supine position, vertical head-up position, and vertical position immersed in water to the neck. Change to the erect posture produced an immediate striking fall in solute and water excretion with increase in urinary osmolarity. Sodium excretion fell.

Renal tissue pressure fell to 50% of control in spite of an increase in arterial blood pressure and inferior vena cava pressure. Immersion in water produced an immediate striking rise in water and solute excretion with fall in urinary osmolarity. Sodium excretion rose. Renal tissue pressure rose to 250% of control. Changes in cardiac output are known to occur with the assumption of the erect position and with immersion in water, output falling with erect posture, and increasing with immersion. The tissue pressure changes measured indicate response to these changes in cardiac output and suggest that initial alterations in sodium and water excretion caused by changes in gravity result from alteration of intrarenal hemodynamics and countercurrent activity.

A65-80176

PULMONARY VASCULAR RESPONSES TO HYPOXIA AND THEIR MODIFICATION BY PHARMACOLOGICAL SYMPATHECTOMY.

Joseph S. McLaughlin, Mortimer J. Buckley, William B. Berry, and Andrew Glenn Morrow (Natl. Heart Inst., Clin. of Surg., Bethesda, Md.) Surgical Forum, vol. 15, 1964, p. 185-186.

In 34 closed chest dogs, pressures were measured simultaneously in the pulmonary artery (PA), pulmonary artery wedge position (PW), and left atrium (LA); total pulmonary blood flow was recorded with an electromagnetic flowmeter as acute hypoxia was induced. Resistance in the various segments of the pulmonary vascular bed was calculated by relating observed changes in pressure and pulmonary blood flow. In 20 control animals hypoxia (5% O₂ for 5 to 7 min) resulted in increases in PA pressure (+38%), PW pressure (+107%), and total PA artery blood flow (+32%), while LA pressure remained unchanged. The effects of hypoxia were assessed in 14 additional dogs, in which biochemical sympathectomy had been effected by pretreatment with intraperitoneal reserpine (0.25 mg/kg/day × 2). When 5% O₂ was given, the average rises in PA and PW were only 10% and 16%, respectively, paralleled by an increase in pulmonary blood flow of 11%. These studies demonstrate that active pulmonary vasoconstriction occurs with hypoxia, probably at the venous level, and that the response is mediated by the sympathetic nervous system.

A65-80177

HYPOTHERMIC REDUCTION OF AMMONIA RELEASE INTO THE CIRCULATION BY THE KIDNEY.

Alfred M. Keirle, Carson M. Lewis, James A. Helmsworth, and William A. Altemeier (Cincinnati U., Coll. of Med., Dept. of Surg.; and V. A. Hosp., Ohio).

Surgical Forum, vol. 15, 1964, p. 102-103.

Under pentobarbital anesthesia, the aorta, right renal vein, and femoral vein of fasting dogs were catheterized. Blood ammonia in these vessels was measured by the Bessman technique prior to and for 5 hours subsequent to intragastric instillation of 50 cc of dog blood per kilogram of recipient weight. Ten dogs were controls and 10 were cooled externally to 88° F within 45 min. after the protein challenge. The average baseline ammonia levels in control animals were 80 μg/100 gm in the aorta, 71 μg/100 gm in the femoral vein, and 140 μg/100 gm in the renal vein. Following the intragastric administration of protein, these values rose in 5 hours to 120 μg/100 gm in the aorta, 120 μg/100 gm in the femoral vein, and 184 μg/100 gm in the renal vein. Elevated aorta levels did not suppress the renal release of ammonia as previously reported. The ammonia levels in the systemic veins exceeded those in the aorta indicating external cooling diminishes the somatic utilization of ammonia. This, however, is negated by the overall reduction in ammonia production.

A65-80178

INFLUENCE OF HYPOTHERMIA AND ANOXIA UPON THE BIOCHEMISTRY OF HEART MUSCLE.

G. Thomas Passanant and Howard D. Strak (Ohio State U., Dept. of Physiol. Chem., and Dept. of Surg., Columbus).

Surgical Forum, vol. 15, 1964, p. 210-212.

Grant No. PHG-G-HE-05273-04.

Desiccated normothermic, hypothermic, and hypoxic dog heart powders, obtained by granulation at the temperature of liquid nitrogen and followed by lyophilization, were extracted with 1.6 M. ionic strength KCl in a phosphate buffer of pH 7.5. Procedures resulting in the elution of the various heart muscle proteins that were differentiated by electrophoresis are described. Elution patterns obtained when the dialyzed extract from normal heart containing 100 mg of protein applied to the column revealed only 20% of the protein applied to the column was eluted. Conversely, when 100 mg of protein obtained from hypoxic heart was treated in like manner, 80% of the applied protein was eluted, most of which was in anionic form. When the protein content of normal heart extracts was increased to 200 mg and chromatographed, the same elution pattern was obtained as when 100 mg of protein was used. Hypothermia produced a decrease in anionic proteins with an increase in the cationic fraction. With hypoxia, there was an increase in both anionic and

cationic fractions with a loss of one entire cationic peak present in both hypothermic and normal heart muscle. The effects of hypoxia and hypothermia on ATP-creatine transphosphorylase, Mg^{++} -activated ATPase, myokinase, and cytochrome activity are described.

A65-80179

PHYSIOLOGY OF EXERCISE.

Ernst Jold (Ky. U., Lexington).

Springfield, Ill., Charles C. Thomas, 1964, vii+145 p.

This is a compilation of articles concerned with research on the physiology of exercise, primarily in the areas of sport and physical education. The subjects covered are data on the growth of athletic records, synonymy characteristics of performance returns in twins, nutrition and efficiency, fitness and overweight, and inability of training to enhance immunologic powers. Recent studies mentioned are global nutrition surveys, genetic determinants of performance, prophylactic effect of sustained exercise with respect to degenerative cardiovascular disease, application of techniques for determination of body composition to sports, and analysis of the high resistance against heat loss in channel swimmers. Selected historical material is included.

A65-80180

THE ROLE OF SKIN AND MUSCLE VESSELS IN THE RESPONSE OF FOREARM BLOOD FLOW TO NORADRENALINE.

C. J. Cooper, J. D. Fewings, R. L. Hodge, G. C. Scroop, and R. F. Whelan (Adelaide U., Dept. of Human Physiol. and Pharmacol., Australia).

Journal of Physiology, vol. 173, Sep. 1964, p. 65-73. 18 refs.

To study the contribution of skin circulation to total forearm blood-flow changes, subjects were heated or cooled, since it has been shown that changes in total forearm blood flow during such procedures are confined to the skin. Skin vessels were constricted by both intra-arterial and intravenous infusions of noradrenaline. However, the magnitude of the skin constriction with any given dose, and therefore its contribution to the total forearm flow response, is greater when the resting level of skin flow is high. The direct action of noradrenaline on the muscle vessels is as a constrictor, but in the case of intravenous infusions a vasodilator component opposes the direct constrictor action, and the resultant effect on the muscle vessels is a balance of these two forces. With intra-arterial infusions the constrictor effects on skin and muscle vessels are additive and fall in forearm flow is seen with all doses. With intravenous infusions the change in total forearm flow is variable and will depend upon the resultant of its direct constrictor actions on the skin and muscle vessels, and the opposing reflex dilator action on the muscle vessels. After most intravenous infusions an "after-dilation" was seen that was confined to muscle.

A65-80181

ROLE OF OXYGEN IN DEVELOPMENT OF PULMONARY HYPERTENSION.

Harold V. Liddle (Donald Guthrie Found. and Guthrie Clin., Sayre, Pa.)

Surgical Forum, vol. 15, 1964, p. 186-188.

NIH Grant H-5866-C1.

Three groups of normal dogs were operated upon under pentothalfluorothane anesthesia. In the animals of Group A (test subjects) and C (controls), the left subclavian artery was anastomosed to the distal end of the left upper lobe pulmonary artery. Group B animals had no disturbance of their pulmonary circulation. Groups A and B were placed in an atmospheric control chamber at an oxygen concentration of 10%. Group C animals were maintained in air. Of the 25 test subjects that were surgically prepared and placed in the 10% oxygen atmosphere chamber, 6 satisfied the experimental criteria through the test periods in 10% oxygen and in air. Of these 6 subjects, 5 developed no pulmonary arteriolar changes during the period of arterial systemic unsaturation, and 1 dog had minimal pulmonary vascular change. After 3 months of normal arterial systemic saturation, all 6 test subjects developed pulmonary arteriolar obstruction which was moderate in 2 and severe in 4 dogs. The unoperated control animals developed no pulmonary vascular changes in the 10% oxygen environment, and the 6 operated control dogs all developed moderate to severe pulmonary vascular disease in air.

A65-80182

INFLUENCE OF PHYSICAL ACTIVITY ON A TREADMILL ON THE METABOLISM OF ADIPOSE TISSUE IN RATS.

Jana Parizkova and Libuse Stankova (Phys. Cult. Res. Inst., Prague, Czechoslovakia).

British Journal of Nutrition, vol. 18, 1964, p. 325-332. 22 refs.

Two groups of male rats were studied during 360 days; one group began training on a treadmill on the 160th day of life. The duration and rate of exercise were gradually increased to 18 m/min for a period of 50 min/day. The weight curves and the weights of the adrenals were the same in both groups. The difference between trained and untrained manifested itself in a different body composition, the trained animals containing a lower proportion of fat. The weights of the tibial and gastrocnemius muscles of trained animals were significantly greater; the percentage of muscle fat did not differ in the two

groups. After 20 min run on the treadmill untrained rats showed an increased oxygen consumption but there was no change in the trained group. The daily caloric intake/100 g body-weight did not differ between the groups; trained rats, however, selected spontaneously equal amounts of the high-starch and high-fat diets, and the controls selected twice as much of the high-fat diet. The amount of high-protein diet ingested was the same in both groups. The adipose tissue of trained animals, apart from forming a smaller proportion of the body, released more nonesterified fatty acids into Krebs-Ringer phosphate than did adipose tissue from untrained animals after an equal amount of adrenaline had been added to the medium.

A65-80183

AEROSPACE MEDICINE.

Lawrence E. Lamb (USAF School of Aerospace Med., Aerospace Med. Div., (AFSC), Brooks AFB, Tex.)

IN: ADVANCES IN INTERNAL MEDICINE.

Edited by William Dock (New York State U. of Med.) and I. Snapper (Beth-El Hosp., Brooklyn, N.Y.)

Year Book Medical Publishers Inc., vol. 12, 1964, p. 175-232. 83 refs.

The medical aspects of aerospace flight encompass an analysis of the job requirements as related to environmental stresses affecting man. These include hypoxia, hyperoxia, hypobaria, hypergravics, hypogravics, radiation, and other stresses. With this knowledge, the important requirements of medical evaluation for selection of individuals to perform the mission must be defined. Finally, there are medical aspects to training for the mission and actual medical maintenance while in flight. This discussion is designed to provide the basis for aeromedical considerations of particular interest to the internist.

A65-80184

MECHANICS OF BREATHING: COMPLIANCE AND RESISTANCE IN THE NORMAL LUNG AND THORAX.

Robert W. Carton (Ill. U., Coll. of Med., Urbana) and John T. Sharp (Ill. U., Coll. of Med.; and V. A. Hosp., Cardiopulmonary Lab., Hines).

IN: ADVANCES IN CARDIOPULMONARY DISEASES.

Edited by Andrew L. Banyai (Marquette U. School of Med., Milwaukee, Wis.) and Burgess L. Gordon (Jefferson Med. Coll., Philadelphia, Pa.)

Chicago, Year Book Medical Publishers Inc., vol. 2, 1964, p. 54-73. 15 refs.

A discussion, which is taken from a lecture course, is presented of some factors in respiratory mechanics. The main parameters of the subject are stated and a model of the respiratory system is shown and analyzed. Mechanics of the lungs during respiratory movement and in static conditions, especially lung compliance and airway resistance, are outlined. The thorax is also analyzed separately under dynamic and static conditions. The lungs and thorax, which act as a unit in life, are discussed as to their mechanics as a single unit. The importance of these findings are cited in relation to tests for pulmonary function and clinical value.

A65-80185

ALVEOLAR GAS EXCHANGE.

Benjamin Burrows (Chicago U., School of Med., Ill.)

IN: ADVANCES IN CARDIOPULMONARY DISEASES.

Edited by Andrew L. Banyai (Marquette U., School of Med., Milwaukee, Wis.) and Burgess L. Gordon (Jefferson Med. Coll., Philadelphia, Pa.)

Chicago, Year Book Medical Publishers Inc., vol. 2, 1964, p. 74-96. 54 refs.

The exchange of oxygen between alveolus and capillary is dependent on the diffusing capacity of the alveolar-capillary membrane and on the characteristics and volume of pulmonary-capillary blood. Carbon dioxide excretion is not significantly diffusion limited. When overall diffusing capacity is markedly reduced, arterial hypoxemia on exertion will result. This is characteristically relieved by the addition of small amounts of oxygen to inspired gas and is not associated with CO_2 retention. Diffusing capacity measurements are imperfect and, under many circumstances, do not accurately reflect the diffusing characteristics of the lung. The wide range of normal for pulmonary diffusion capacity (D_L) measurements and their tendency to be reduced by a wide variety of lung disorders limit the clinical usefulness of such determinations. A low D_L without a typical pattern of arterial hypoxemia should not be interpreted as evidence of an "alveolar-capillary block". Even when there is a true limitation of diffusing capacity, the defect is more often owing to loss of functioning alveolar-capillary units than to an actual "block" between the gas and blood.

A65-80186

ON THE BEHAVIOR OF FREE FATTY ACIDS IN PLASMA AFTER PHYSICAL STRESS [ZUM VERHALTEN DER FREIEN FETTSÄUREN IM PLASMA NACH KÖRPERLICHER BELASTUNG].

H. Wuschek, W. Köhler, W. Friedel, and G. Welsch (Med. Klin. der Charité, Berlin, Germany).

Das Deutsche Gesundheitswesen, vol. 19, Oct. 22, 1964, p. 2020-2022. 11 refs. In German.

The authors determined the behavior of the free fatty acids of the total cholesterol, of free cholesterol, and of ester cholesterol, as well as of the total lipids in eight athletes following a heavy physical load (100 km bicycle race). The increase of the free fatty acids and of free cholesterol observed after such a load could be statistically proved, while an increase of the total cholesterol was merely suspected. The ester cholesterol showed an uncharacteristic behavior. The determination of the total lipids was made in so few subjects that an interpretation of this value was not possible. In our opinion, the increase of the free fatty acids should be regarded as an adaptive reaction of the organism to an extremely high physical load. By means of the fraction of free fatty acids, the fat mobilized from the depots is quickly transported to the locus of consumption to serve as a source of energy.

A65-80187

HEARING DAMAGE IN PILOTS DUE TO BLAST TRAUMA [KNALLTRAUMATISCH BEDINGTE HÖRSCHÄDIGUNGEN BEI FLUGZEUGFÜHRERN]. Gerhard Fröhlich (Flugmed. Inst. der Luftwaffe, Fürstenfeldbruck, Germany). *Wehrmedizinische Mitteilungen*, vol. 10, 1964, p. 150-152, 153-154. In German.

Six cases of blast-traumatized ears are described in detail. These cases were selected from a group of 20 pilots and aviation cadets with hearing losses representative of different types of weapons. Hearing losses inflicted by blast trauma were diagnosed in a total of 28 ears. In 8 individuals both ears were traumatized; in 7 individuals the right ear was damaged; and in 7 others the left ear was damaged. Mean hearing loss in decibels was larger for the left ears. Frequency range of hearing losses was primarily between 6000 to 8000 cps. In contrast to noise trauma where the maximum hearing losses lie at 4000 cps. Speech perception is preserved in blast trauma. Tinnitus lasting several hours to several days is frequently reported after exposure. Seven of the 20 individuals incurred hearing damage while supervising rifle practice. Prophylactic measures recommended are the use of cotton wad in the ear or ear protectors during rifle practice and audiometric investigation of any complaint of tinnitus after the shooting practice.

A65-80188

INVESTIGATIONS ON THE EFFECT OF NEGATIVE ATMOSPHERIC IONS ON THE MUTATION RATE IN *DROSOPHILA MELANOGASTER* [UNTERSUCHUNGEN ZUR WIRKUNG NEGATIVER ATMOSPHERISCHER KLEINIONEN AUF DIE MUTABILITÄT BEI *DROSOPHILA MELANOGASTER*]. E. Magdon, H. Cziharz, and G. Winterfeld (Deutsche Akad. Wiss., Inst. für Biophysik, Robert-Rössle-Klin., Berlin, Germany). *Zeitschrift für Naturforschung*, vol. 19B, Sep. 1964, p. 863-864. In German.

Adult (1 to 3 days old) males of *Drosophila melanogaster* were exposed for 16 hours to negative air ions generated by a tritium ion generator. Although a greater rate of recessive lethal factors was observed in two series after exposure to negative ions, the difference was statistically insignificant as compared to controls. However, the slight increase in the number of recessive lethal factors suggests that a significant increase of the mutation rate may be achieved with a greater number of chromosomes and the use of a higher capacity ion generator.

A65-80189

THE EFFECTS OF CENTRAL BODY AND TRUNK SKIN TEMPERATURES ON REFLEX VASODILATATION IN THE HAND. K. E. Cooper, R. H. Johnson, and J. M. K. Spalding (United Oxford Hosp., MRC Body Temp. Res. Unit and Dept. of Neurol., Oxford, Great Britain). *Journal of Physiology*, vol. 174, Oct. 1964, p. 46-54. 14 refs.

Twenty-seven subjects were investigated to determine the effect of central temperature on reflex vasodilatation in the hand or finger in response to radiant heating of the trunk. Nine subjects were investigated to determine the effect of skin temperature of the trunk upon this reflex vasodilatation. If the initial central temperature was 36.8° C or above, hand or finger vasodilatation occurred within 2 min of heat being applied to the trunk. If the central temperature was 36.5° C or below, vasodilatation only occurred when the central temperature had risen above 36.5° C. Reflex vasodilatation in the hand was progressively depressed as trunk skin temperature fell below 33° C. If the hand was immersed in water at 40° C, reflex vasodilatation was restored in it. It is concluded that reflex vasodilatation of the hand on trunk heating is prevented by a central temperature below 36.5° C and is progressively depressed as trunk skin temperature falls below 33° C. This inhibition by a low skin temperature cannot be attributed to insensitivity of reflex receptors on the trunk.

A65-80190

CIRCADIAN RHYTHMS DURING AND AFTER THREE MONTHS IN SOLITUDE UNDERGROUND.

J. N. Mills (Manchester U., Dept. of Physiol., Great Britain). *Journal of Physiology*, vol. 174, Nov. 1964, p. 217-231. 27 refs.

A record of times of sleep of a man spending 105 days in solitude underground showed that he fell asleep and woke a little later day by day, following a sleep-waking cycle of roughly 24 1/2 hr. Collection and analysis each week of 36-hr urine in a series of samples showed that potassium excretion followed

a similar rhythm. For eight weeks, excretion of sodium and chloride followed a rhythm similar to that of potassium, but thereafter they became dissociated from it, and increasingly irregular. Creatinine excretion was always low during sleep. Phosphate excretion always fell about the time of waking. It is maintained that sleep-wakefulness, potassium excretion, and, for a time, chloride excretion, followed a free-running rhythm with cycle length slightly over 24 hr. On emerging, the subject spent 3 1/2 days in bed in a hospital; during the first 24 hr his potassium excretion followed a circadian rhythm with maximum about 01.00 hr, whereas during the last 24 hr excretion of potassium, sodium, and chloride had returned approximately to normal phase relations.

A65-80191

THE EFFECT OF WARNING INTERVAL VARIABILITY ON THE LATENCY OF THE INVOLUNTARY BLINK RESPONSE TO INTENSE VISUAL STIMULATION.

D. H. Drazin and A. Irving (R.A.F. Inst. of Aviation Med., Farnborough, Hampshire, Great Britain).

Journal of Physiology, vol. 174, Nov. 1964, p. 265-272. 6 refs.

The latencies of the human blink reflex to intense visual stimulation and the voluntary blink response to a stimulus of less intensity were recorded in two conditions of warning-interval variability. The latencies of reflex and voluntary responses were both found to be related to the warning interval preceding the stimulus and also to the range of warning intervals which preceded earlier stimuli. The experimental findings are interpreted as evidence of cortical involvement in the optical blink reflex, the cortex either serving as a relay in the reflex arc or exercising continuous control over an extracortical relay.

A65-80192

MYELOPATHY IN WORKERS WITH A VIBRATION HAZARD [MYELOPATIE U PRACUJICICH V RIZIKU VIBRACE].

Vajla Stybölva (Prague U., Neurol. Clin., Czechoslovakia).

Pracovní lékařství, vol. 16, Aug. 1964, p. 254-257. 6 refs. In Czech.

Organic findings were demonstrated in a selected group of workers exposed to vibration risk. The diffuse nature and the type of involvement of the peripheral motor neurone in its proximal part, and the possible involvement of the upper motor neurone, indicate a lesion of the spinal cord, mainly of the cervical intumescence. In most cases it was not a simple myelopathy but a combination affecting the peripheral nervous system. It is assumed that the diagnosis of myelopathy clarifies findings of indefinite location. The conclusion is drawn that the changes found arise on the basis of microtrauma of the cord and that the pathological changes develop not only on the basis of vertebrogenic changes, but also due to reflex vascular changes arising from pathological vasomotor reactions.

A65-80193

INFORMATION REDUCTION IN THE ANALYSIS OF SEQUENTIAL TASKS.

Michael I. Posner (Wis. U., Madison).

Psychological Review, vol. 71, Nov. 1964, p. 491-504. 38 refs.

Contract AFOSR AF 49(638)-449.

This paper proposes a taxonomy of information-processing tasks. Information conserving, reducing, and creating operations are viewed as different methods of processing. The main concern of this paper is information reduction which, it is suggested, represents a kind of thinking in which the solution is in some way implicit in the problem, but in which the input information must be reflected in a reduced or condensed output. A number of tasks within the areas of concept identification and utilization are shown to have this character. If the tasks require complete representation of the stimulus in the response (condensation) the amount of information reduced is directly related to difficulty both during learning and in utilization of previously learned rules. If the tasks allow subjects to ignore information in the stimulus (gating) the direct relation between reduction and difficulty is found during learning but may not occur after the rule is learned.

A65-80194

REACTIONS OF EOSINOPHIL COUNT TO OCULAR LIGHT STIMULI

[REAKTIONEN DER EOSINOPHIEN-ZAHLE AUF OKULARE LICHTREIZE].

F. Hollowich and S. Tilgner (Jena U., Augenklinik, Germany).

Deutsche Medizinische Wochenschrift, vol. 89, 1964, p. 1430, 1433-1434, 1435-1436. 28 refs. In German.

Experiments on the effect of light on eosinophil granulocytes in peripheral circulation led to the following conclusions: (1) Eosinophil count in man and mice is subject to a 24-hour sinusoidal rhythm with an interspecific phase difference of 180°. This rhythm is adjusted to the normal or the artificial light-darkness periodicity. Light stimuli synchronize the changes in eosinophil count with the given day-night rhythm. The timing function of the light is mediated through the eye. Intensive light stimulation evokes marked eosinopenia in humans and animals. The reaction is quantitatively similar in humans and mice, in spite of the phase difference. Bilateral enucleation of the eyes in mice eliminates light eosinopenia. In this experimental setup light eosinopenia was dependent upon the ocular perception of light. There was a quantitative nonlinear correlation between the intensity of light and the

strength of the eosinopenic response. The eosinopenic effect of light was independent of the wavelength in contrast to the wavelength specificity of gonadal stimulation.

A65-80195

EVOKED RESPONSE LATENCY AS A FUNCTION OF STIMULUS RISE-TIME IN THE AUDITORY CORTEX.

James E. Pugh (Princeton U., Dept. of Psychol., N.J.)
Journal of Auditory Research, vol. 4, Jul. 1964, p. 145-149. 8 refs.
NIH, ONR, and Higgins Funds supported research.

The latency of evoked potentials from the auditory cortex of the cat is reduced when the rate of rise of the stimulating tone is increased. The change in latency varies slightly with the intensity level of the stimulus. For strong tone, a decrease in rise time (increase of rate of rise) from 40 to 6 msec reduces the latency by a factor of three, whereas for weaker tones this same change reduces the latency by a factor close to four. These results support the view that the auditory system is in some sense a rate detector.

A65-80196

THE ELECTROMYOGRAM AS AN INDICATOR OF HEARING RESPONSE.

Kenneth W. Berger (Kent State U., Speech and Hearing Clin. Ohio).
Journal of Auditory Research, vol. 4, Jul. 1964, p. 151-158. 6 refs.
Electromyographic recordings from the forearm extensor and flexor locations were measured while a subject made voluntary responses to pure tones near threshold and 90 dB above threshold. There was no significant difference between the onset times or magnitude of muscle response from the flexor and from the extensor areas. Muscle action onset times were observed consistently and significantly prior to the 90-dB sensation level tone presentation; however, there was no statistically significant difference between the magnitude of muscle response to tones at or near threshold vs tones at 90 dB above threshold.

A65-80197

AMPLITUDE CHANGES OF EVOKED POTENTIALS AT THE INFERIOR COLLICULUS DURING ACOUSTIC HABITUATION.

C. W. Dunlop, W. R. Webster, and R. H. Day (Sydney U., Dept. of Physiol., Australia).
Journal of Auditory Research, vol. 4, Jul. 1964, p. 159-169. 13 refs.
Natl. Health and Med. Res. Council of Australia supported research.

Evoked potentials were recorded from unanesthetized cats using bipolar stainless steel electrodes implanted in the inferior colliculus. Acoustic habituation was studied as a function of three levels of stimulus intensity (85, 95, and 105 dB sound pressure level), the stimuli consisting of 20-msec bursts of 1000 pulses per sec. All animals were given two test sessions at each intensity level. Each test consisted of a 20-msec burst of a given intensity being presented every 2 sec for 95 min. It was observed that acoustic habituation occurs in the inferior colliculus and that the degree of habituation is an inverse function of stimulus intensity. The results are interpreted as indicating that the stimulus properties must be systematically varied in any study of habituation.

A65-80198

INCREASE OF WHOLE BLOOD LACTIC ACID CONCENTRATION DURING EXERCISE AS PREDICTED FROM PH AND PCO₂ - DETERMINATIONS.

B. F. Visser, Joh. Kreukniet, and A. H. J. Maas (State U. Hosp., Dept. of Pulmonary Diseases, Utrecht, The Netherlands)
Pflügers Archiv für die gesamte Physiologie des Menschen und der Tiere, vol. 281, Oct. 22, 1964, p. 300-304. 6 refs.
In 67 test subjects, an attempt was made to establish whether it is possible to predict the change in the lactic acid concentration of the arterial blood during exercise from the calculated metabolic changes in the bicarbonate concentration of the arterial blood during exercise. The changes in the HCO₃⁻ and the lactic acid concentration averaged -4.15 and 4.41 mEq/liter, respectively. It was possible to predict the measured change in lactic acid concentration from the change in HCO₃⁻ concentration calculated from the pH and the carbon dioxide tension (PCO₂). A respiratory correction in the calculation ensured the best correlation coefficient (0.81). The regression equation was $\Delta \text{lactic acid} = 0.29 + 0.99 \Delta \text{HCO}_3^-$ metabolic. An equally good approximation was attained in calculating the change of lactic acid concentration from the total change in bicarbonate concentration, with application of a simplified respiratory correction: $\Delta \text{lactic acid} = 0.33 + 0.97 (\Delta \text{HCO}_3^- \text{ total} - 0.18 \Delta \text{PCO}_2)$. The correlation coefficient remained 0.81.

A65-80199

A CLINICAL COMPARISON OF TWO METHODS FOR MEASURING ABNORMAL AUDITORY ADAPTATION BY MEANS OF THE BÉKÉSY AUDIOMETER.

Tokuro Suzuki, Nobuo Yoshie, Nagamasa Sakabe, and Eikichi Igarashi (Shinshu U., Dept. of Otolaryngol., Matsumoto, Japan).
Journal of Auditory Research, vol. 4, Jul. 1964, p. 195-205. 31 refs.
A clinical comparison of threshold tone decay (TTD) and Békésy fixed-frequency threshold tracing shift (TTS) phenomena was studied by means of

self-recording techniques with a Békésy audiometer. TTD and TTS tests were given to 10 listeners with normal hearing, 16 people with conductive deafness, and 42 persons with perceptive deafness. Results of this experiment indicated that normal subjects and patients with conductive deafness showed neither TTD nor TTS, that TTD and TTS were found in cases of perceptive deafness, and that occurrences of TTD were more frequent than those of TTS. All cases who showed TTS also showed TTD. The reason why TTD occurs more often than TTS may be because the manner in which the stimulus is presented in the TTS test allows for some degree of recovery from adaptation, which is not true in the TTD test. Although positive TTD and TTS both suggest abnormal adaptation, these phenomena seem not to have identical significances. The two tests cannot be substituted for each other. To detect abnormal auditory adaptation, both TTD and TTS should be measured.

A65-80200

A RESONANCE THEORY OF "MICROVIBRATIONS": A REPLY TO ROHRACHER.

James G. L. Williams, (Neb. U., Coll. of Med., Neb. Psychiat. Inst., Lincoln).
Psychological Review, vol. 71, Nov. 1964, p. 526-527.

It is suggested that the resonance theory adequately accounts for those of Rohrer's findings, which he quotes as being inconsistent. There is at present no evidence for or need to suggest a relationship between the frequency of microvibrations and that of the "alternating contractions of single-motor units." This suggestion in no way detracts from the importance or value of the microvibration phenomenon itself.

A65-80201

COMMENTS ON "A RESONANCE THEORY OF MICROVIBRATIONS".

Hubert Rohrer (Vienna U., Austria).
Psychological Review, vol. 71, Nov. 1964, p. 524-525. 5 refs.
Experiments pertaining to the theoretical interpretation of "microvibration" (permanent micromovements of the human body) are quoted that exclude any resonance effects and thus are contradictory to Williams' hypothesis that the frequency of microvibration originates in resonance effects.

A65-80202

PHYSICAL ACTIVITY AND CARDIOVASCULAR HEALTH.

Samuel M. Fox III and James S. Skinner (PHS, Heart Disease Control Program, Washington, D.C.).
American Journal of Cardiology, vol. 14, Dec. 1964, p. 731-746. 97 refs.

A review of investigations on the relation of physical activity to cardiovascular health and disease was undertaken, with a brief discussion of some mechanisms that might play a part. There is suggestion that recent activity is more important than activity earlier in life; even a light or moderate amount of physical activity may have significance. Encouraging as this is, most studies are of occupational activity and might not have direct applicability to physical activity undertaken as preventive therapy. Evidence that increased physical activity might be beneficial is sufficient to justify further extensive studies. More information is needed concerning the mechanisms of the possible benefits. There is much virtue in a study of men with high indexes of risk relative to coronary heart disease. Increased communication and joint planning among physicians, physical educators, physiologists, and biometricians are needed.

A65-80203

EFFECTS OF A PROGRAM OF ENDURANCE EXERCISES ON PHYSICAL WORK: CAPACITY AND ANTHROPOMETRIC MEASUREMENTS OF FIFTEEN MIDDLE-AGED MEN.

James S. Skinner, John O. Holloszy, and Thomas K. Cureton (Ill. U., Phys. Fitness Res. Lab., Urbana).
American Journal of Cardiology, vol. 14, Dec. 1964, p. 747-752. 27 refs.
PHS Contract 86-63-79.

Fifteen previously sedentary professional men, ranging in age from 35 to 55 years, participated in a 6-month program of endurance conditioning exercises consisting of running and calisthenics, which became progressively more strenuous. Exercise capacity and body specific gravity increased significantly. It is concluded that a vigorous exercise program is feasible for actively employed, middle-aged professional men and that such a program produces changes in functional capacity and body composition that run counter to the trend usually seen with aging.

A65-80204

EFFECTS OF A SIX MONTH PROGRAM OF ENDURANCE EXERCISE ON THE SERUM LIPIDS OF MIDDLE-AGED MEN.

John O. Holloszy, Gelson Toro, James S. Skinner, and Thomas K. Cureton (Ill. U., Phys. Fitness Res. Lab., Urbana).
American Journal of Cardiology, vol. 14, Dec. 1964, p. 753-760. 38 refs.
PHS Contract 86-63-79.

The effect of six months of physical conditioning, consisting of calisthenics and distance running, upon serum lipids was studied in a group of middle-aged professional men. Mean serum cholesterol and phospholipid levels did not change significantly with training. Serum triglycerides, however, fell from a mean pretraining level of 208 ± 127 to 125 ± 78 mg percent at the end of the study ($p < 0.01$). This exercise-induced reduction in serum triglycerides

appears to be an acute effect occurring within 2 to 3 hours following exercise and lasting about 2 days. From these results, it would appear that serum triglyceride levels can be kept significantly lower by means of regularly performed endurance exercise. This reduction in serum triglyceride levels may represent one mechanism by which exercise possibly could protect against coronary heart disease.

A65-80205

EFFECT OF PHYSICAL CONDITIONING ON CARDIOVASCULAR FUNCTION: A BALLISTOCARDIOGRAPHIC STUDY.

John O. Holloszy, James S. Skinner, Alan J. Barry, and Thomas K. Cureton (Ill. U., Phys. Fitness Res. Lab., Urbana).
American Journal of Cardiology, vol. 14, Dec. 1964, p. 761-770. 62 refs.

Fifteen middle-aged men participated in a program of endurance exercise and running for six months. Changes in cardiovascular function were evaluated by using an air-supported ultralow-frequency ballistocardiography. Significant increases occurred in mean I, J, GI, HI, and IJ forces. Four of the five men with initially abnormal ballistocardiograms had normal records at the end of the program.

A65-80206

AN ESSAY ON THE STRENGTH OF THE HEART AND ON THE EFFECT OF AGING UPON IT.

Isaac Starr.

American Journal of Cardiology, vol. 14, Dec. 1964, p. 771-783. 30 refs.
 NIH Grant H625 (C1 to 15).

The problem of estimating the strength of the heart is stated in terms of various physical and physiological concepts. These include Newtonian work, tension-time, blood pressure, cardiac output, and blood movement. Quantitative and qualitative methods are discussed. Most measurements of the various aspects of cardiac function that can be expressed quantitatively, such as cardiac output, slope of ascending pulse-wave front, and ballistocardiogram, indicate that cardiac function diminishes at a rate of between 0.5% to 2% a year as age advances. There is an apparent exception to this rule, because estimates of cardiac strength based on the classic method, the pulse amplitude, suggest that cardiac strength increases as age advances. An explanation for this apparent discrepancy is advanced. In addition to diminishing in strength, there is an increased tendency for the heart's contraction to become more incoordinate as age advances.

A65-80207

CARDIAC PERFORMANCE IN RELATION TO BLOOD VOLUME.

George E. Burch and Nicholas P. Depasquale (Tulane U. School of Med., Dept. of Med., New Orleans, La.)

American Journal of Cardiology, vol. 14, Dec. 1964, p. 784-795. 22 refs.
 PHS supported research.

The influence of total blood volume on cardiac performance is poorly understood. The relation between ventricular blood volume and cardiac performance was studied in great detail beginning with the classic experiments of Frank and Starling. The principles set forth in the Frank-Starling law pertain only to the denervated isolated heart, however. Although the Frank-Starling law may be applicable to the intact heart in the completely basal state and in some diseased states, conditions that evoke neurohumoral responses to regulate cardiac performance greatly modify this law. The influence of cardiac volume on cardiac performance can be further understood by applying well-known physical principles to the heart. Comparison of the time courses of volume, pressure, force, work, and tension of normal-sized (100-cc end-diastolic volume) to dilated (500-cc end-diastolic volume) hearts demonstrate the mechanical disadvantage under which the dilated heart operates. The clinical application of the concepts derived from such considerations, particularly the use of prolonged bedrest, was discussed.

A65-80208

CARDIAC PERFORMANCE IN RELATION TO ALTITUDE.

Bruno Balke (FAA, Civil Aeromed. Res. Inst. Oklahoma City, Okla.)

American Journal of Cardiology, vol. 14, Dec. 1964, p. 796-810. 68 refs.

An attempt was made to estimate the work of the heart, its oxygen requirements, and the demands on coronary blood flow from measured and/or estimated parameters such as blood pressure, stroke volume, heart rate, hemoglobin, and arterial and myocardial oxygen tensions. Resting values of coronary flow thus estimated (at sea level) compared favorably with "textbook figures." Similar evaluations of work situations under normal and reduced atmospheric air pressures lead to the conclusion that limitations in maximal coronary blood supply determine the range of cardiac performance capacity and, therefore, the individual range of physical working capacity, under normal atmospheric conditions, as well as at altitude.

A65-80209

EVALUATION AND PREDICTION OF PHYSICAL FITNESS, UTILIZING MODIFIED APPARATUS OF THE HARVARD STEP TEST.

John L. Patterson, Jr., (Va. Med. Coll., Dept. of Med., Richmond) Ashton Graybiel, (US Naval School of Aviation Med., Pensacola, Fla.) Harry F. Lennhardt, (US Naval Hosp., Philadelphia, Pa.), and M. Jones Madsen

American Journal of Cardiology, vol. 14, Dec. 1964, p. 811-827. 21 refs.

Maximal and submaximal tests of physical fitness are described. The apparatus used was the 20-inch step of the Harvard step test by the addition of a horizontal bar for a handhold by the subject. Two maximal tests, termed the capacity pack test, were similar in technique, except for the use in the pack test of a back pack loaded to one third of the subject's weight. Cadence of the exercise was 2 sec, representing 30 steps/min. The end-point of the maximal tests was the inability of the subject to maintain exercise at the prescribed rate. The capacity step test was found suitable for evaluating the physical fitness of all subjects except the unusually fit, for whom the pack test was better suited. Performance on these two tests was studied on several hundred normal military and civilian personnel in the age range of 18 to 45 years, and in five categories of physical training. In submaximal step exercise of prescribed duration, the continuously recorded heart rate showed a high degree of consistency in the same subject on different days, provided the subject maintained a stable way of life. The three and one half to four-minute pulse count during recovery from five minutes of submaximal step exercise had the greatest value for predicting duration in the capacity step test. From this pulse count, an equation was derived for predicting duration in the maximal test. Recovery heart rate following submaximal exercise of fixed duration was studied repeatedly in patients during convalescence from acute tonsillitis, alcoholism, and infectious mononucleosis.

A65-80210

AURICULAR FIBRILLATION IN AN ASYMPTOMATIC YOUNG MAN: EFFECTS OF EXERCISE, DIGITALIZATION, ATROPINIZATION AND THE RESTORATION OF NORMAL RHYTHM.

Ashton Graybiel (US Naval School of Aviation Med., Pensacola, Fla.)

American Journal of Cardiology, vol. 14, Dec. 1964, p. 828-836. 20 refs.

An athletic young man in whom atrial fibrillation was the only abnormality discovered was able to exercise strenuously for periods of 4 to 6 minutes with ventricular rates in the range of 250 to 260/min. Digitalization (leaf preparation) resulted in a substantial lowering of the maximal ventricular rate on a standardized exercise but had only a small effect on the increase of rate. With digitalization the duration of exercise increased and, inexplicably, the maximal increase (11 min) occurred long after omission of the drug. The effect of the drug on ventricular rate during exercise was evident for over two weeks after omission. Atropinization resulted in an increase in ventricular rate of about half that manifested after exercise. The maximal rate was reduced following digitalization, but the increase in rate was only slightly less than in its absence. After restoration of normal rhythm the duration of exercise increased to nearly 14 minutes. The ventricular rates for comparable durations of exercise before (with digitalization) and after restoration of normal rhythm were substantially lower in the latter circumstance.

A65-80214

TUBERCULOSIS IN AIR FORCE MILITARY PERSONNEL ON THE BASIS

OF MEDICO-LEGAL PROVISIONS ESTABLISHED BY THE MEDICAL COMMITTEE ON THE I.A.F. PSYCHOPHYSIOLOGICAL INSTITUTE OF ROME, IN THE DECADE 1954-1963 (CONTINUATION AND CONCLUSION) [LA TUBERCOLOSI NEL PERSONALE MILITARE DELL'A.M. SULLA SCORTA DELLE PRATICHE MEDICO-LEGALI DEFINITE DALLA COMMISSIONE MEDICA DELL'ISTITUTO MEDICO-LEGALE A.M. DI ROMA NEL DECENNIO 1954-1963 (CONTINUAZIONE E FINE)].
 E. Angeloni (Ist. Med.-Legale A.M. "Aldo di Loreto", Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 27, Jul.-Sep. 1964, p. 365-400. 14 refs. In Italian.

This is the concluding portion of a survey on tuberculosis among Italian Air Force personnel and deals with data on pilots and flight specialists in order to ascertain a possible relation between flight activity and tuberculosis. Fourteen cases of pulmonary and pleural tuberculosis are reviewed. A significant relation between flight activity and aggravation of pulmonary tuberculosis was demonstrated in pilots. Special consideration was given to the various types of aircraft and flight activity. This relation was less evident in specialists who were subject to other factors. It is recommended that adequate preventive measures be adapted by flight surgeons and by the Psychophysiological Institute of Rome. The highest incidence of tuberculosis was found in enlisted men. Provisions are proposed to reduce both the morbidity of the first months of service and the financial burdens imposed on the State Administration. Some procedural and financial benefits are described that would be derived from a rational revision of medico-legal legislation on tuberculosis.

A65-80215

INFLUENCING MOTOR RESPONSES TO GRAVITATIONAL STIMULI BY CHANGING THE SENSORY PERCEPTION OF PIGEONS.

Z. Novotny.

Rivista di Medicina Aeronautica e Spaziale, vol. 27, Jan.-Mar. 1964, p. 5-16. 14 refs.

Pigeons under conditions of short-term reduction of gravity produced a motor response of the wings. The individual threshold of this reaction in g values was assessed in normal pigeons after nonsurgical elimination of vision, after labyrinthectomy preserving eyesight, and after labyrinthectomy with simultaneous elimination of vision. Assessment was also made of the effect of multiple, repeated, graded, gravitational stimuli on the threshold level of

the motor response of the wings. Motor activity was not equally dependent on the excitability of the vestibular apparatus in all pigeons as indicated by the different results following interference with visual perception. As a result of multiple repeated gravitational stimuli in acute experiments, a mild increase of the threshold values was found, which was interpreted as the result of habituation to a stereotype stimulus. The individually different and important roles of vision and the vestibular apparatus during the effectuation of spatial exploratory reflexes probably depend on the type of central nervous system and the standard of its analytical and synthetic activity. A secondary, though important role is played by the peripheral sensory system.

A65-80216

CAUSES FOR DISQUALIFICATION IN PILOT CANDIDATES OF THE ITALIAN MILITARY AIR FORCE AFTER THE WAR [SULLE CAUSE DI NON IDONEITA' NEGLI ASPIRANTI PILOTI DELL'AERONAUTICA MILITARE ITALIANA NEL DOPOGUERRA]. G. Paolucci (Ispettorato di Sanita' Aeron., Rome; and Rome U., Ist. di Patol. Gen., Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 27, Jan.-Mar. 1964, p. 17-25. In Italian.

A statistical analysis is presented of the pathological causes for the disqualification of pilot candidates (average age, 20 years) in the Italian Air Force for the two 7-year periods, 1948 to 1954 and 1955 to 1961. An increase was found in organic heart diseases; vascular, bronchial and blood diseases; neurosis; epilepsy; thyroid, labyrinthine, and hearing disorders; hernia; flat foot; syphilis; and tooth diseases. On the contrary, a decrease was observed in "slender build"; tuberculosis; pleuritis; and visual, nasal, urinary, liver, and functional heart diseases.

A65-80217

APPLICATION OF SURGERY IN CASES OF DEAFNESS IN FLIGHT PERSONNEL [SULL'IMPIEGO DELLA COFO-CHIRURGIA NELLA SORDITA DEL PERSONALE AERONAVIGANTE]. R. Caporale and G. Mazza (Centro di Studi e Ric. di Med. Aeron. e Spaziale; Ist. Med.-Legale A.M. "Aldo di Loreto"; and Ispettorato di Sanita' Aeron., Rome, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 27, Jan.-Mar. 1964, p. 26-39, 9 refs. In Italian.

Until a few years ago flying personnel with severe or progressive hyposcusia were permanently grounded because arrest of or recovery from hearing loss was impossible. Numerous surgical techniques (tympanoplasty, fenestration, stapes mobilization, intraposition or supraposition of fenestra ovale) permit the treatment of deafness due to otosclerosis. As related to flying personnel, postoperative return to flight duty may be affected by the pathogenic factors of sound trauma and repeated barotrauma. A case is reported of a pilot with otosclerosis treated by surgical interposition who resumed his flight duties. Hearing recovery remained unaltered even after two years and flying activity of 2000 hours, with exposure to sudden changes in barometric pressure during landing. A brief review of the literature is included on the incidence of otosclerosis, percentage of surgical success according to technique, postoperative failures and complications, and indications and contraindications for the surgical treatment of otosclerosis in flying personnel.

A65-80218

SURVEY, WITH PERSONAL CONTRIBUTIONS, ON THE PHYSIOLOGICAL, ANATOMICAL, AND PATHOLOGICAL EFFECTS OF EXPLOSIVE DECOMPRESSION ON ANIMALS AND MAN AND RECENT DEVELOPMENTS IN THEIR ETIOPATHOGENIC INTERPRETATION [STUDIO SINTETICO, CON CONTRIBUTO PERSONALE, SUGLI EFFETTI FISIO- ED ANATOMO-PATOLOGICI PROVOCATI DALLA DECOMPRESSIONE ESPLOSIVA SUGLI ANIMALI E SULL'UOMO, ED ORIENTAMENTI ATTUALI SULLA LORO INTERPRETAZIONE ETIOPATOGENETICA]. Gaetano Rotondo (Milan U., Ist. di Fisiol. Umana, Italy). *Rivista di Medicina Aeronautica e Spaziale*, vol. 27, Jan.-Mar. 1964, p. 40-90, 77 refs. In Italian.

A review is presented of the etiopathogenic factors related to induction of the physiological and anatomo-pathological effects of explosive decompression, including the rapid expansion of body gases, the rapid liberation of gas in liquids and organic tissues, and the effect of shock waves generated during explosive decompression. Discussion follows on the physiopathological effects of explosive decompression on the gastrointestinal, respiratory, cardiovascular, blood and nervous systems, the sense organs, skin, and organic liquids in experimental animals. A complete description is given of the anatomic and histopathological picture of lesions in various organs and systems and their respective pathogenesis. An analysis is made of reported studies in man that establish survival possibilities, and tolerance thresholds in cases of rapid decompression during high altitude flight with pressurized planes. Recommendations are made for the preventive medical selection of personnel involved in high altitude flight, the use of aeromedical experimentation in airplane design, construction and operation, and the application of protective measures during rapid decompression at high altitude.

A65-80219

ABSORPTION OF CARBON TETRACHLORIDE, TRICHLOROETHYLENE, TETRACHLOROETHYLENE, METHYLENE CHLORIDE, AND 1,1,1-TRICHLOROETHANE THROUGH THE HUMAN SKIN. Richard D. Stewart and Hugh C. Dodd (Dow Chem. Co., Med. Res. Lab., Midland, Mich.).

Industrial Hygiene Journal, vol. 25, Sep.-Oct. 1964, p. 439-446. 7 refs.

A series of human absorption experiments were conducted in which the skin of the hands was exposed to carbon tetrachloride, trichloroethylene, tetrachloroethylene, methylene chloride, or 1,1,1-trichloroethane. The amount of the compound in the alveolar air during skin exposure and in the postexposure period was determined using gas chromatographic methods. The significance of the skin exposure was estimated by comparing the concentration of the solvent in the alveolar breath following the skin exposure with previously obtained data of the alveolar breath concentration following a vapor exposure to a known concentration of the solvent. The amount of solvent penetrating the skin was related to the area of skin exposed, the method of application to the surface of the skin, the type of skin exposed, and the duration of exposure.

A65-80220

ROCKET EXHAUST AIR POLLUTION PREDICTION AND VERIFICATION. F. W. Boone and L. D. Van Vleck (Aerojet-Gen. Nucleonics, Health and Safety Dept., San Ramon, Calif.).

Industrial Hygiene Journal, vol. 25, Sep.-Oct. 1964, p. 499-506. 20 refs.

The introduction of foreign material into the atmosphere as a result of rocket propellant test firings cannot be qualitatively disregarded; nor can promising propellants be qualitatively discarded simply because they contain toxic materials. A reliable method must be developed, tested, and verified for quantitatively evaluating the significance of such test firings in terms of both local and general air pollution. Existing verified basic turbulent diffusion formulations were extended to consider the characteristics of rocket exhaust clouds. Empirical formulations were also developed to consider the initial rise and size of such clouds. The theoretical effect of the "capping" inversion was reduced to equation form.

A65-80221

THE EFFECT OF STRENUOUS EXERCISE ON SERUM LIPIDS AND ENZYMES.

George L. C. Calvy, Lawrence H. Coffin, Jr. (Naval Med. Field Res. Lab., Camp Lejeune, N.C.), Menard M. Certler, and Lee D. Cady (New York U. Med. Center, Inst. of Phys. Med. and Rehabil.).

Military Medicine, vol. 129, Nov. 1964, p. 1012-1016.

One hundred and eleven Marine recruits were fed diets of large fat content (about 45%) for a period of 11 weeks during heavy physical exercise. Most of the fat was of animal origin. Serum lipids, uric acid, and blood enzymes were measured during the training cycle. A significant increase in the serum triglyceride level was noted, which correlated with past results. There was no significant change in the other compounds. The rise in triglyceride can be based on the intake of saturated fats.

A65-80222

DEPERSONALIZATION IN SPACEMEN AND SUBMARINERS.

Mardi J. Horowitz (Clin. Investigation Center, US Naval Hosp., Oakland, Calif.). *Military Medicine*, vol. 129, Nov. 1964, p. 1058-1060.

Contract Nonr 222 (51) (NR 105 156).

The depersonalization or derealization syndrome in response to altered environment, metabolism, or emotional stress is discussed as a potential threat to the effective functioning of astronauts or submariners. It is characterized by feelings of unreality with respect to self, the world, the body, or the time; and secondarily by overt anxiety, dizziness, and perceptual changes. Experience with normal individuals and psychiatric patients suggests that an individual's effectiveness during depersonalization may remain unimpaired depending on his reaction to the symptom itself, e.g., reality testing is often intact. Individuals who react with panic or who habitually employ this state as a psychological defense mechanism are particularly vulnerable. Screening techniques for selection of submarine and space personnel require experimental validation. Techniques discussed in some detail are (1) psychiatric interview techniques, (2) field dependence-interdependence tests, (3) Ganzfeld experiences (restricted sensory input), and (4) thresholds for hallucinations (with the use of psychotomimetic drugs).

A65-80223

PARACHUTING INJURIES: THEIR PREVENTION.

Wallace Rex Davis (82d Airborne Div., Fort Bragg, N.C.).

Military Medicine, vol. 129, Nov. 1964, p. 1071-1076.

The greatest number of injuries from parachuting are due to poor landing body position and wind. The incomplete opening of a malfunctioning parachute, "stolen air," and downdrafts will add to the speed with which the body strikes the ground, and the impact may be so abrupt that injury is unavoidable; but frequently a good body position will attenuate the shock and the jumper may escape serious injury. Periodic classroom refresher training combined with continued practical training is a must in military parachuting. Careful safety inspections and an alertness on the part of the jumpers are

the mainstays of good safety records. "Riding in" malfunctions and standing landings should be discouraged. The jumper who is in topnotch physical condition, mentally alert, and proficiently trained will not encounter many accidents or be seriously injured.

A65-80224

CELLULAR AND SUBCELLULAR RESPONSES TO ULTRAVIOLET RADIATION.

P. O'B. Montgomery, and Rolland C. Reynolds (Tex. U. Southwestern Med. School, Dept. of Pathology, Austin; and Woodlawn Hosp., Dallas, Tex.) *Laboratory Investigation*, vol. 13, Oct. 1964, p. 1243-1253. 21 refs. AEC Contract AT-(40-1)-2478; and Damon Runyon Memorial Fund for Cancer Research Grant DRG-355F.

These studies demonstrate that all of the morphologic structures of the cell respond to ultraviolet irradiation. These include the various membranes such as the cytoplasmic membrane, the endoplasmic reticulum membranes, the mitochondrial membranes, the membranes of the paranuclear body, and the nuclear membrane. The chromatin material of the nucleus and the nucleolus undergo profound alterations as a consequence of ultraviolet irradiation. In view of the multiplicity of the structures and components within the cell, which express evidence of ultraviolet damage, it is very unlikely that damage to any one structure or component represents the target area of ultraviolet damage.

A65-80225

ELECTROCONVULSIVE RESPONSES OF RATS TO CONVULSANT AND ANTICONVULSANT DRUGS DURING HIGH-ALTITUDE ACCLIMATIZATION. Laura S. Castillo and Paola S. Timiras (Calif. U., Dept. of Physiol., Berkeley.) *Journal of Pharmacology and Experimental Therapeutics*, vol. 146, Nov. 1964, p. 160-166. 25 refs. PHS Grant GM-9267.

The groups of adult, male Long-Evans rats were studied. One group (the controls) was maintained at sea level. The other two were taken to the Barcroft Laboratory of the White Mountain Research Station, at 12 470 feet, where they were kept for 3 days and 42 days, respectively. Each group was further subdivided into several subgroups: rats of one subgroup did not receive any drug, and served as untreated controls; the animals of the other subgroups were injected subcutaneously with graded doses of convulsants (strychnine and pentylenetetrazol) and anticonvulsants (acetazolamine and diphenylhydantoin). The drugs were administered in a single injection, with the exception of diphenylhydantoin which was administered once daily for 4 or 7 days. Durations of phases of maximal electroshock seizures and of postseizure depression, and ED50 for convulsant and anticonvulsant actions were compared before and after drug injections at sea level and at altitude. A significant increase in convulsability, as quantified by shortened tonic flexion, increased incidence and duration of tonic extension and lowered ED50, for convulsants, and increased ED50 for one of the anticonvulsants (acetazolamide), was observed in animals at altitude. The increased convulsability was accompanied by a longer postseizure depression in the altitude-acclimatized rats than in the sea-level controls. It is postulated that the increased convulsability at altitude can be related to depression of the inhibitory action of the higher CNS centers on the lower centers. Differences in the magnitude of convulsant and anticonvulsant effects at sea level and at altitude could also be ascribed to differences in circulating levels of the drugs due to changes in detoxifying and excretory rates.

A65-80226

ELECTRONYSTAGMOGRAPHIC ANALYSIS OF HEALTHY MAN [ROZBOR ELEKTRONYSTAGMOGRAMU ZDRAVYCH OSOB].

A. Široký and Krejčová (Prague U., Neurol. Clin., Czechoslovakia). *Ceskoslovenská fysiologie*, vol. 13, 1964, p. 337-342. 44 refs. In Czech.

The analysis of 25 electronystagmograms of healthy individuals showed that the duration of the first phase of post-rotational nystagmus, its amplitude, and frequency furnish characteristic parameters for the evaluation of the vestibular mechanism. The authors determined that, of these parameters, the parameter of the duration of the first phase of the post-rotational nystagmus is the least reliable. The evaluation of the function of the vestibular apparatus by means of one parameter is of little clinical value; only the mutual correlation of all three parameters (duration, amplitude, and frequency of the first post-rotational nystagmus) gives an accurate picture of the functional state of the cupuloendolymphatic system. It seems, that the delay in the appearance of the post-nystagmus is physiological and is caused predominantly by the interval in the oculo-vestibular reflex arc.

A65-80227

CIRCULATORY RESPONSES TO HYPOCAPNIA IN THE ANESTHETIZED DOG.

Hermes A. Kontos, H. Page Mauck, Jr., David W. Richardson, and John L. Patterson Jr. (Va. Med. Coll., Dept. of Med., Richmond). *American Journal of Physiology*, vol. 208, Jan. 1965, p. 139-143. 16 refs. Contract Nonr-1134(05); and NIH Grants H-3361 and HTS-5573.

The circulatory responses to hypocapnia were studied in 40 anesthetized dogs. Hypocapnia induced without a change in ventilation caused slight increase in limb vascular resistance in six dogs and decrease in one. Hypocapnia

induced by hyperventilation caused increase in limb vascular resistance in six dogs and decrease in four. Following administration of phenoxymethamine into the femoral artery, hypocapnia induced by either method invariably caused increase in limb vascular resistance (8 dogs). These results show that hypocapnia has a direct vasoconstrictor effect on limb blood vessels. In the intact limb this response may be opposed by vasodilator effects mediated through nerves. Hypocapnia induced without change in ventilation had no significant effect on cardiac output, systemic vascular resistance or arterial blood pressure (8 dogs). Hypocapnia induced by increased ventilation was associated with significant decreases in cardiac output and systemic arterial blood pressure and significant increase in systemic vascular resistance (9 dogs). These responses were probably related to the effects of increased intermittent positive pressure used to augment ventilation.

A65-80228

EFFECT OF HIGH INTRA-ALVEOLAR O₂ TENSIONS ON PULMONARY CIRCULATION IN PERFUSED LUNGS OF DOGS.

G. J. A. Cropp (Calif. U., Med. Center, Cardiovascular Res. Inst., San Francisco). *American Journal of Physiology*, vol. 208, Jan. 1964, p. 130-138. 35 refs. PHS Grants HE-06285 and HTS 5251.

The resistance to blood flow in the pulmonary circulation of dogs (PVR) increased when their lungs were ventilated with 95% to 100% oxygen and were perfused with blood that recirculated only through the pulmonary circulation; the systemic circulation was perfused independently. This increase in PVR occurred even when nerves were cut or blocked, but was abolished by inhaled isopropylarterenol aerosol. Elevation of intra-alveolar P_O₂ without increase in pulmonary arterial blood P_O₂ was sufficient to increase pulmonary vascular resistance. The pulmonary venules or veins were thought to be the likely site of the constriction. These reactions were qualitatively similar to those produced by injection of serotonin or histamine into the pulmonary circulation. The time course of the response and failure to obtain it when the blood was perfused through the remainder of the body before it reentered the pulmonary circulation are compatible with a theory that high intra-alveolar O₂ tension activates a vasoconstrictor material in the pulmonary parenchyma.

A65-80229

EEG CHANGES IN STATES FOLLOWING PROFESSIONAL CARBON DISULPHIDE POISONING.

J. Volavka.

(8th Czechoslovakian EEG Meeting, Oct. 1963.)

Activitas Nervosa Superior, vol. 6, 1964, p. 268-271. 7 refs.

Twenty male workers were examined clinically and electroencephalographically in an average 7.6 months after the last exposure to CS₂. At that time clinical recovery was complete in 8 workers. Normal EEG was found in 6 subjects, 4 of them with actual clinical symptoms. The group of the patients with EEG abnormalities did not differ significantly from subjects with normal EEG in the average length of exposure to CS₂, in the time elapsed from the last exposure or in age. Correlation between the latter three variables and either the voltage of the EEG or the actual clinical symptoms was not proved. The clinical picture of the CS₂ intoxication is probably more influenced by such factors as individual sensitiveness and personality. A single EEG examination cannot contribute substantially to the assessment of individual cases of the states following the CS₂ poisoning.

A65-80230

BRAIN LEVELS OF FREE AMINOACIDS IN CARBON MONOXIDE ANOXIA IN RATS [ZMENY VOLNYCH AMINOKYSELIN V MOZKU KRYŠ ZA ANOXIE ZPUSOBENE KYSLICNIKEM UHELNATYM].

A. Šklenovský (Ústav Patol. Fyziol. Lékařsk. Olomouc, Czechoslovakia). *Activitas Nervosa Superior*, vol. 6, 1964, p. 272-275. 20 refs. In Czech.

A significant decrease in glutamic acid (by 15%), glutamine (by 16%), serine, and glycine; and a significant increase in alanine were found after 25 minutes CO anoxia. The level of gamma-aminobutyric acid did not change. The results are related to a stimulation of glycolysis and simultaneous depression of aerobic oxidation of glucose in the Krebs cycle. The changes observed may participate in the mechanism of functional brain disorders in anoxia.

A65-80231

A NEW METHOD OF CALCULATING THE RESTING ENERGY OUTPUT OF THE ORGANISM.

L. Novák (Czechoslovak Acad. of Sci., Inst. of Biophys., Brno). *Physiologia Bohemoslovenica*, vol. 13, 1964, p. 370-378. 10 refs.

A new method for deriving the total heat output of a resting homiothermic organism is given. An equation is presented and fully explained as to its derivation from the physical parameters used. These include factors of the environment as well as physical characteristics of the organism. Evidence of experimental verification is presented, and practical use of this equation is discussed.

A65-80232

PRIMARY CORTICAL RESPONSE (PCR) OF THE SOMATOSENSORY AREA IN RATS DURING PROLONGED HYPOXIA.

J. Holubar (Czechoslovak Acad. of Sci., Inst. of Physiol., Prague). *Physiologia Bohemoslovenica*, vol. 13, 1964, p. 397-404. 20 refs.

The primary cortical response (PCR) of the somatosensory area (S1) to stimulation of the sciatic nerve was studied in 34 rats in a state of incomplete recovery from asphyxial hypoxia of short duration, in which the changes caused by hypoxia were sufficiently stable and incompletely reversible until after a long time. In bipolar recordings with one microelectrode against a wick electrode on the surface of the cortex, the same negative deflection was found throughout the full depth of the cortex (it was sometimes larger at deeper levels). In monopolar recordings it was less distinct. In bipolar recordings with a double microelectrode, at a standard distance between the tips (0.1 mm in a longitudinal direction and 0.25 mm in a transversal direction) the first maximum at the surface was completely absent, or of opposite polarity (as compared with the prehypoxia recording) while the second and third maximum persisted. It is shown in the discussion that dissociation of the individual deflections of the deep records of the PCR caused by protracted hypoxia is evidence in support of the previously expressed hypothesis of the mechanism of the PCR. The PCR seems to be produced by summation of the potentials of at least two generators, the first of which, is localized near the surface and responsible for the initial, surface-positive component of the PCR, being more sensitive to hypoxia than the second generator, which is localized deeper down and is responsible for the second, surface-negative component of the PCR.

A65-80233

BIOCHEMICAL AND MORPHOLOGIC CHANGES IN BRAIN TISSUE INDUCED BY VIBRATION [ZMIANY BIOCHEMICZNE I MORFOLOGICZNE W TKANCE MOZGOWEJ POD WPKYWEM WIBRACJI]. Lech Markiewicz, Włodzimierz Missiuro, Zofia Brzezińska, and Anna Sawicka (Zakład Fizjol. i Hig. Pracy, Entalny Inst. Ochrony Pracy, Warszawa, Poland). *Acta Physiologica Polonica*, vol. 15, Jul.-Aug. 1964, p. 495-501. 11 refs. In Polish.

The effects of vibration on the functional state of the central nervous system were studied. Experiments were carried out on the behavior of the mediators of the nervous system, noradrenaline and acetylcholine, in the brains of rats subjected to vibrations of frequencies of 50 and 75 cps, four hours each day, during one week. An increase in both mediators was observed. The highest values of noradrenaline were found four hours after single exposure to vibration. The increase in acetylcholine at that time was 111% of normal at a frequency of 50 cps and 116% at a frequency of 75 cps. After several days of exposure to vibration, the high levels of acetylcholine diminished, but were still 55% to 58% above normal. Noradrenaline content was also elevated, in proportion to exposure time increases. After 6 days of exposure, the values were 100% higher at a frequency of 50 cps, and 32% at a frequency of 75 cps. Histologic examinations of the brains revealed disappearance of tigris in the cytoplasm of the nerve cells, especially in the hypothalamus. As may be seen from the experimental findings, vibration of this intensity induces changes in the structure of the nerve cells and increases the levels of the adrenergic and cholinergic mediators. Even brief vibration is probably not without effect on the body.

A65-80234

THE INFLUENCE OF HIGH TEMPERATURES ON THE BIOELECTRIC ACTIVITY OF MUSCLES [WPYK WYŚKIES TEMPERATURY NA CZYNNOSC BIOELEKTRYCZNA MIĘSNI]. Zbigniew Edelwejn (Wojskowego Inst. Med. Lotniczej, Warszawa, Poland). *Acta Physiologica Polonica*, vol. 15, Jul.-Aug. 1964, p. 503-511. 12 refs. In Polish.

This study is a continuation of the investigations of the influence of physical factors on the bioelectric action of muscles. Taking consecutive records of the potentials at the intramuscular temperature ranging from 37°C to 41°C, the author studied behavior of the basic parameters of action potentials of the gastrocnemius muscle in rabbits under conditions of an overheated environment. A comparison of the findings obtained with 50 rabbits showed that when the intramuscular temperature was increased, the following effects could be observed: (1) Statistically significant rise of the percentage of polyphasic potentials (from 11% to 31%). (2) Statistically significant shortening of the polyphasic potential duration (from 9.5 m/sec at the intramuscular temperature of 37°C to 7.1 m/sec. at 41°C). The author believes that the most probable explanation of the described changes in action potentials is that the rise in the intramuscular temperature enhances the velocity of conduction in the neuron supplying the particular muscle fibers of the motor unit, resulting in a shortening of the action potential.

A65-80235

CIRCULATORY EFFECTS AND CARDIOPULMONARY ADAPTATION DURING FLIGHTS TO GREAT HEIGHTS. R. E. Mitchell (US Naval Aviation Med. Center, Naval School of Aviation Med., Pensacola, Fla.). *Military Medicine*, vol. 129, Dec. 1964, p. 1186-1190. 22 refs.

Vehicles, some of which produce great accelerative and decelerative forces, capable of flights to great heights into a deficient ambient environment are

now available. Because of the unusual forces and the deficient environment, certain physiologic responses may occur. Generally man has tolerated the changes, at least within limits of present knowledge. However, the effects of certain aspects of the environment, particularly those of prolonged exposure to weightlessness, are not known and require further study. A great deal of experimentation concerning all aspects of high altitude flight in preparation for space flight has taken place. However, because of the very limited experience in space, relatively little information is available to prove or disprove the experimental results. Much remains to be done.

A65-80236

THE FLIGHT MEDICAL OFFICER'S BAG. Harvey R. Rutstein (Mount Sinai Hosp., Dept. of Surgery, New York, N.Y.). *Military Medicine*, vol. 129, Dec. 1964, p. 1202-1204.

Items suggested for inclusion in the Flight Medical Officer's bag are listed and discussed. Instruments and materials, injection drugs, and oral drugs are included. The primary purpose of the Flight Medical Officer's bag is to dispense drugs and materials for treating casualties of aircraft accidents and incidents, ground mishaps, and support facility disasters. Preparedness must be maintained at all times for treating multiple burns, fractures, lacerations, and shock cases. A second function of the bag is that of serving as a small dispensary in case of isolation in a national disaster. It also should supply common drugs for respiratory and infectious diseases, allergic disorders, gastrointestinal problems and instruments for minor surgical procedures for trauma cases.

A65-80237

DISCRIMINATIVE BASIS FOR ASTRONAVIGATION IN BIRDS. Merle E. Meyer (Wash., U., Seattle). *Journal of Comparative and Physiological Psychology*, vol. 58, Dec. 1964, p. 403-406. 5 refs.

Matthews has suggested that birds use sun navigation to obtain their orientation. He hypothesized that the bird assesses the sun's arc and uses the altitude of the highest point to obtain its latitude, and changes in the arc angle (together with a sense of time), to estimate its longitude. This study investigated birds' ability to discriminate these dimensions and concluded that homing pigeons are able to detect movement at 15° an hour, and can discriminate changes in altitude and changes in arc angle. The level of discriminated changes of altitude and arc angle would not support pinpoint navigation, but the study provides data compatible with Matthews' theory.

A65-80238

EFFECT OF ALTITUDE ON ATHLETIC PERFORMANCE. Jose Cervantes and Peter V. Karpovich (Springfield Coll., Mass.). *Research Quarterly*, vol. 35, Oct. 1964, p. 446-448.

An analysis is given of the observations made regarding the effects of altitude on the performance of 39 participants in the 1955 Pan-American Games held at Mexico City (7000 feet altitude). Such events as running, swimming, jumping, and throwing are compared in each individual as to his performance at home and in Mexico City. Sprint events are not affected by altitude, while the performances in swimming suffered significant decreases even though the athletes were partially acclimatized to Mexico City. In the field events results were inconsistent. Some of the athletes did worse and some better than at home. Acclimatization times for training for the various performances are estimated.

A65-80239

APPARENT VERTICALITY: FUNDAMENTAL VARIABLES OF SENSORY-TONIC THEORY REINVESTIGATED. Daniel J. Weintraub (Mich. U., Ann Arbor), Daniel C. O'Connell (Harvard U., Cambridge, Mass.), and Thomas J. McHale (Ill. U., Urbana). *Journal of Experimental Psychology*, vol. 68, Dec. 1964, p. 550-554. 10 refs.

Early studies consistently emphasized the striking accuracy with which subjects make vertical settings from various initial positions. Nonetheless, Werner and Wapner have found confirmation for a sensory-tonic theory of perception in systematic departures from vertical settings. The hypothesis of the present research has been that these departures were really dependent on the methodology, and that the magnitudes of errors of anticipation are a function of the degrees through which the rod has to be rotated to the vertical. Instead, striking accuracy, especially with the right hand, was again confirmed, and no significant departures dependent on amount or direction of rotation were found. Settings with the left hand were significantly different from settings with the right hand. This is the sole finding that is in accordance with sensory-tonic predictions.

A65-80240

SUCCESSIVE CONTRAST INVOLVING LUMINANCE AND PURITY ALTERATIONS OF THE GANZFELD. Daniel J. Weintraub (Mich. U., Ann Arbor). *Journal of Experimental Psychology*, vol. 68, Dec. 1964, p. 555-562. 11 refs.

Observers were adapted to a homogeneous visual field by projecting red light onto a translucent eye cap. Following chromatic adaptation, homogeneous postadapting fields differing in luminance and/or colorimetric purity were introduced, producing successive contrast. Using an adapting red of

purity 1.00, 8 of 10 observers adapted chromatically. With an adapting stimulus, postadapting fields equal to or greater than the colorimetric purity of the red adapting field were perceived as red. Postadapting fields of purity less than that of the adapting field were perceived as complementary blue-green. The luminance of the postadapting field had little effect upon hue. Thus the importance generally attached to luminance parameters in producing chromatic afterimages is not supported.

A65-80241

DISINHIBITION IN GSR CONDITIONING AS A FUNCTION OF THE NUMBER OF CS-UCS TRIALS AND TEMPORAL LOCATION OF THE NOVEL STIMULUS.

H. D. Kimmel and W. A. Greene (Fla. U., Gainesville).

Journal of Experimental Psychology, vol. 68, Dec. 1964, p. 567-572. 8 refs. Grants NIH M-6060 and MH-06060-2.

A study was made of the magnitude of galvanic skin response (GSR) to a novel stimulus (NS) presented during the conditioned stimulus (CS)-unconditioned stimulus (UCS) interval after varying numbers of conditioning trials at 5 points in the CS-UCS interval. Three hundred sophomores, in six groups of fifty, received either 0, 1, 2, 10, 25, or 50 conditioning trials with a 7.5-sec CS (visual) and a shock UCS. Following training the NS (auditory) was presented with the CS at 5 points in the CS-UCS interval. The GSR to the CS + NS increased in negatively accelerated fashion as a function of N, while the GSR to the CS alone went up and, then, went down. The temporal function of the GSR to the NS was flat prior to any conditioning, negative early in conditioning, and positive after 25 and 50 trials. These results were interpreted to mean that inhibition of delay develops during conditioning so that the focal point of excitation in the CS-UCS interval gradually shifts during conditioning from a point near the onset of the CS to a point near the time of delivery of the UCS.

A65-80242

VISUAL SIGNAL DETECTION AS A FUNCTION OF SEQUENTIAL VARIABILITY OF SIMULTANEOUS SPEECH.

John S. Antrobus (Columbia U., Teachers Coll., Morningside Heights, N.Y.) and Jerome L. Singer (City U., City Coll., New York, N.Y.)

Journal of Experimental Psychology, vol. 68, Dec. 1964, p. 603-610. 9 refs. NIH Grant M-2279.

Two experiments compare signal detection (brightness discrimination) during 2 concurrent cognitive tasks, varied talking and repetitive counting. Twenty-four subjects served two 2-hour sessions under each talking condition. Reported drowsiness and sleeping were higher during counting sessions and detections correlated between -0.39 and -0.64 with drowsiness. However, detections were not different under the two conditions. In Experiment II, forty subjects served eight 3-min trials under each condition with counterbalancing to minimize differential arousal. Lively band music between trials maintained arousal. Detections were significantly lower under varied talking. Results suggest that when environmental stimulation maintains arousal, subject-generated cognitive stimuli interfere with signal detection; when environmental stimulation is low, subject-generated stimuli support arousal but the positive effect of arousal on detections is obscured by the interference effect of subject-generated cognitive stimuli.

A65-80243

INSTRUCTIONAL SETS AND SUBJECTIVE CRITERION LEVELS IN A COMPLEX INFORMATION-PROCESSING TASK.

William C. Howell and David L. Kreidler (Ohio State U., Columbus).

Journal of Experimental Psychology, vol. 68, Dec. 1964, p. 612-614. Contract AF 33(657)-10763.

A paper and pencil task requiring counting, identifying, and locating operations was performed by 4 groups of subjects (fast-accurate, fast-inaccurate, slow-accurate, and slow-inaccurate) under 3 different instructional sets (speed, accuracy, and speed-accuracy emphasis). Groups were defined on the basis of pretest performance. Results support the common finding that subjects choose a high accuracy criterion under speed-accuracy instructions. Contrary to earlier results on a simpler task, this choice of criteria yielded poorer correct response rates than did that resulting from speed instructions. The savings in speed were greatest for the initially slow groups; further, these groups did not suffer severe accuracy decrements as a result of speed instructions.

A65-80244

APPLICATIONS OF POWER FUNCTIONS TO PERCEPTUAL-MOTOR LEARNING.

Joseph C. Stevens (Harvard U., Cambridge, Mass.)

Journal of Experimental Psychology, vol. 68, Dec. 1964, p. 614-616.

The data from a study of 2-hand coordination learning are replotted in such a way that exact equations can be written for the 4 learning curves obtained. The cumulated time on the target turns out to be a power function of the practice time, and the differences in the learning of groups who were high and low in visual and kinesthetic sensitivity become more evident in the values of the exponent and the intercept constant of the function.

A65-80245

A THEORY OF THE BINOCULAR CYCLOPEAN FIELD: ON THE POSSIBILITY OF SIMULATED STEREOPSIS.

Julian Hochberg (Cornell U., Ithaca, N.Y.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 685. 6 refs. NSF Grant GB-71.

In binocular rivalry a contour in one eye inhibits the other eye's view within a contralateral suppressive field (CSF) of about 0.25° of visual arc; therefore, the two images that are disparate within the ranges needed for stereopsis to occur are also within the CSF in which one suppresses the other. Also, by inserting contours in stereograms so that one view is suppressed, stereodepth is lost. A hypothesis is proposed of a binocular cyclopean field, constructed piecemeal out of the contents of one eye or the other. Suggestions are made for experimental verification of the hypothesis.

A65-80246

PERCEPTION BIBLIOGRAPHY: XVI. PSYCHOLOGICAL INDEX, NO. 12, 1905.

R. B. Ammons and C. H. Ammons (Mont. State U., Missoula)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 691-694. 117 refs.

This continuation of reference listings concerned with perception contains 117 items that do not overlap those appearing in Baldwin's Dictionary.

A65-80247

EYE MOVEMENT PATTERNS AS A FUNCTION OF PREVIOUS TACHISTOSCOPIC PRACTICE.

Amy Schaffer and John D. Gould (IBM Watson Res. Center, Yorktown Heights, N. Y.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 701-702.

Eye movement patterns during a scanning task were compared for subjects with over 100 hr. practice in tachistoscopic experiments and subjects with no such practice. The task consisted of scanning numeric matrices to determine the frequency of appearance (0 to 7) of a predesignated digit. The tachistoscopically practiced group scanned more quickly and made significantly more errors. Both groups showed significant variation in scan time as a function of the particular digit scanned for and as a function of frequency of appearance of the digit being scanned for.

A65-80248

RHYTHMIC ACTIVITY AND THE DISCRIMINATION OF STIMULI IN TIME.

Bruce Denner, Seymour Wapner, and Heinz Werner (Clark U., Worcester, Mass.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 723-729.

PHS Grant MH-00348-14.

Two experiments were conducted to test the effect of changes in motoric activity on the thresholds for critical flicker frequency and apparent motion. The main findings were that an increase (decrease) in motoric activity above (below) the preferred rate delays (fosters) the perception of fusion and simultaneity. These findings were interpreted as giving evidence for the notion that organismic rhythms are critical in the temporal organization of perceptual events.

A65-80249

DEPTH DISCRIMINATION FOR INTERMITTENT STIMULI.

Michael W. Gaynor and Eugene A. Craig (Lehigh U., Bethlehem, Pa.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 752.

Nat. Inst. of Mental Health Grant MH 1709.

Depth discrimination for intermittent stimuli presented to one eye, both eyes simultaneously, and both eyes alternately was studied with a group of 30 subjects. The best depth discrimination was attained by the binocular group, intermediate by the alternate group, and the poorest by the monocular group.

A65-80250

AUTONOMIC CORRELATES OF ELECTRICAL EXCITABILITY OF THE EYE.

Johs. Clausen and Rathe Karrer (Training School, Vineland, N. J.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 753-754. 5 refs.

NSF Grant G-7029.

Sensitivity of the eye to 20-cps sine wave stimulation was compared in normal adults to blood pressure (BP), heart rate, finger volume, galvanic skin resistance (GSR), and alpha waves for the four dimensions of resting level, spontaneous activity, autonomic lability, and adaptation. No simple relation seems to exist between phosphene threshold and autonomic functioning. Contrary to expectation, greater autonomic activity (BP and GSR) seems to go with high threshold. It is suggested that the data may be explained in terms of level of anxiety rather than arousal.

A65-80251

THERMAL STIMULATION OF EXPERIMENTALLY VASOCONSTRICTED HUMAN SKIN.

William W. Dawson (US Army Med. Res. Lab., Psychol. Div., Fort Knox, Ky.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 775-788. 29 refs.

Measures of cutaneous thermal threshold were made at several adapting temperatures above and below normal surface temperature under control and conditions of superficial vasoconstriction by adrenaline chloride. Three practiced subjects reported thresholds that varied systematically from control thresholds although the resting temperature of the vasoconstricted area was maintained at the level of adjacent surface by artificial means. The thermal threshold varied with the degree of vasoconstriction and the adapting temperature. High negative correlations were found between the empirically determined warm thresholds in normal skin, and the degree of vasomobility was calculated from data that treated cutaneous microcirculation. The paucity of knowledge of histology of the innervation of the microcirculatory systems prevented a complete integration of data and theory.

A65-80252

CONSTANCY OF URINARY CATECHOLAMINE EXCRETION.
Paula Parkai and Marianne Frankenhaeuser (Stockholm U., Psychol. Lab., Sweden).

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 789-790. 5 refs.
U. of Stockholm and Swedish Med. Res. Council supported research.

The constancy of adrenaline and noradrenaline excretion was estimated by calculating correlations between excretion rates of both hormones in four series of urine samples obtained from 15 subjects at one week intervals. The constancy of excretion rates was shown to be satisfactory for quantitative studies.

A65-80253

BUTTON-PRESSING FOR A TIME-OFF REWARD DURING SENSORY DEPRIVATION: V. EFFECTS OF RELATIVELY COMFORTABLE AND UNCOMFORTABLE SESSIONS.

Ascanio M. Rossi and Philip Solomon (Harvard Med. School and Boston City Hosp., Mass.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 803-807. 7 refs.
Grant Nonr-1866(29).

Ten subjects underwent two 3-hour sensory deprivation (S-D) sessions exactly one week apart. One session was designed to be potentially more discomforting for subjects and was termed the uncomfortable session. The order of sessions was counterbalanced with five subjects used for each of the two orders. During both sessions subjects were given the opportunity to button-press for a promised time-off reward. Before and after each session subjects rated their state of well-being. Analyses of the results indicated that subjects engaged in significantly more button-pressing for the promised time-off reward during the uncomfortable session than during the comfortable session.

A65-80254

RETINAL LOCUS IN TACHISTOSCOPIC BINOCULAR COLOR RIVALRY.
Herbert F. Crovitz (V. A. Hosp., Durham, N. C.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 808-810.

Tachistoscopic binocular color rivalry was studied for stimuli either centrally fixated or displaced into the left or the right visual field. The distribution of two-color configurations did not differ markedly among the three locations, but the relative proportion of the percept seen in the color presented to the right eye was less for the left field stimuli than for foveal stimuli or right field stimuli.

A65-80255

GAMMA MOVEMENT: APPARENT MOVEMENT IN FIGURAL AFTEREFFECTS EXPERIMENTS.

John J. Winters, Jr. (Edward R. Johnstone Training and Res. Center, Borden-town, N. J.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 819-822. 11 refs.

Standard contour circles, 40 mm in diameter, were tachistoscopically presented for one second. With each presentation 0.8 seconds after the onset, one of a number of comparison circles, varying in diameter from 32 to 48 mm, was presented alongside for 0.2 seconds. Those comparison circles which were equal to and slightly smaller than the standard-circles were judged larger significantly more often than chance. Thus, the initial phase of gamma movement, the apparent expansion of briefly exposed figures, was elicited under conditions comparable to those of some figural aftereffect experiments.

A65-80256

EFFECTS OF INTERMITTENT VISUAL INPUT DISRUPTION, FLICKER-RATE, AND WORK TIME ON TRACKING PERFORMANCE AND ACTIVATION LEVEL.
M. Russell Harter (San Diego State Coll., Calif.), Robert G. Eason (San Diego State Coll., and Navy Electron. Lab., Calif.), and Carroll T. White (Navy Electron. Lab., San Diego, Calif.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 831-848. 35 refs.
Navy Electron. Lab. supported research.
NSF Grant GB-231.

The effects of flicker-rate (0 to 24 cps) on rotary tracking performance and physiological indicants of activation level were studied under two conditions of background illumination (illuminated and nonilluminated). During the illuminated condition the target was visible between flashes (continuously), whereas during the nonilluminated condition it was visible only during the

flash. Muscle tension of the neck and forearm flexor muscles, skin conductance, and heart rate were used as indicants of activation level. Tracking performance varied significantly with flicker-rate and illumination level. During the illuminated condition, performance decreased then increased as flicker-rate increased, the low point being at about 9 cps. During the nonilluminated background condition, performance increased rapidly as flicker-rate was increased up to 9 cps. Further increases had relatively slight effects on tracking performance. The physiological indicants remained essentially constant when flicker-rate was varied, indicating no change in activation level. The performance data were interpreted in terms of a psychological moment model.

A65-80257

COMMENT ON THE "POSITIVE FEEDBACK" METHOD OF TIME ESTIMATION.

Helen L. White (Inst. for Juvenile Res., Chicago, Ill.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 851-854. 8 refs.

Certain conclusions drawn by Llewellyn-Thomas (1959) regarding subjects giving successively longer or successively shorter reproductions of time intervals when their judgments were used as the standards for each succeeding trial are proposed here to be based on differences in curve forms that were an artifact of the plotting method. His data were replotted, and rather than showing great differences between two subjects whom he selected as representative of two types of responders, indicated a great deal of similarity between them. Judgment drift, the tendency to give successively longer judgments as a function of repeated estimates, is discussed as an alternative hypothesis to account for his data.

A65-80258

CORRELATION OF PULSE AND TIME JUDGMENT.

Frank M. Ochberg, Irwin W. Pollack, and Eugene Meyer (Johns Hopkins Hosp., Baltimore, Md.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 861-862. 6 refs.

Twenty hospitalized subjects were ranked according to mean pulse rate over a 5-day period and according to variability of pulse. There was no correlation between these rank orders and results on time judgment tests.

A65-80259

PERCEPTUAL DELAYS AND SPEED OF READING AND TAPPING.

Albert J. Dinnerstein and Bernard Blitz (N. Y. Med. Coll., Dept. of Phys. Med. and Rehabil., N. Y.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 867-873. 8 refs.

Vocational Rehabil. Admin. Grant RD-1196-M-63; and Nat. Inst. of Mental Health Grant MH 0765-01.

Simultaneous presentation of two stimuli from different modalities often produces an experience of apparent sequence. There are stable individual differences in the direction and degree of this temporal displacement. Comparing the relative latency of perception of visual and tactile stimuli by the above procedure, it was hypothesized that intermodal differences in perceptual latencies will produce a corresponding hierarchy in speeds of reading and tapping. The results were in accord with this hypothesis. The relationship between perceptual latency and behavior was most evident, however, only among the older and less educated subjects.

A65-80260

ACTIVATION AND BEHAVIOR: II. VISUALLY EVOKED CORTICAL POTENTIALS IN MAN AS INDICANTS OF ACTIVATION LEVEL.

Robert G. Eason, (San Diego State Coll., and Navy Electron. Lab., Calif.)
Lewis R. Aiken, Jr., Carol T. White, and Malcolm Lichtenstein (Navy Electron. Lab., San Diego, Calif.)

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 875-895. 19 refs.

Navy Electron. Lab. supported research.
NSF Grant GB-231.

The effects of variations in behavioral arousal and neural activation or excitation on averaged evoked occipital-cortical potentials to a repetitive flashing light stimulus were studied, using the Mnemotron computer of average transients (CAT). Degree of behavioral arousal and neural activation was manipulated by having subjects perform physical and mental tasks of varying degrees of difficulty. Records obtained under these conditions were compared with those obtained during periods of physical and mental quiescence wherein activation level was assumed to be at a relatively low level. The evoked potential patterns were found to increase in amplitude and/or change in waveform with increases in level of activation or arousal. A number of techniques for quantifying differences in evoked cortical potential patterns were described. It was concluded that the evoked potential measure may be added to the repertory of physiological measures.

A65-80261

TYPES OF OBJECTIVE ELECTRICAL VESTIBULOGRAMS.

John J. Dunstone and Ernest Dzendolet (Mass. U., Amherst).

Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 899-904. 10 refs.
PHS Grant NB-03675-02.

Objective electrical vestibulograms (plots of objectively determined absolute thresholds against stimulus-frequency for a lateral swaying response

in standing, blindfolded subjects to sinusoidal electrical stimuli of various frequencies passed between the subjects, mastoid processes) were determined for 32 subjects, 19 in the present experiment, and a total of 13 from two earlier experiments. The vestibulograms of individual subjects could be visually separated into six types, with four of them accounting for 28 or 87.5% of the 32 subjects. The shapes of the first four types were supported by the results of a factor analysis. The visual separation criteria were individual vestibulograms having: (1) a maximum at 4.0 cps, (2) peaks at 0.50 and 4.0 cps, (3) peaks at 0.50 and 2.0 cps, (4) a maximum at 1.0 cps, (5) a maximum at 0.20 cps, and (6) a maximum at 2.0 cps. A test showed that these six types were not related to differences in modes of swaying of subjects in response to the different stimulus frequencies.

A65-80262

AGE AND SEX PARAMETERS IN PSYCHOMOTOR LEARNING.

Clyde E. Noble (Ga. U., Athens), Elaine L. Baker, and Thomas A. Jones (Mont. State U., Missoula).
Perceptual and Motor Skills, vol. 19, Dec. 1964, p. 935-945. 34 refs.
NHL Grant MH-07798-01.

Quantitative relationships were sought among psychomotor response speed (R), number of practice trials (T), chronological age (A), and biological sex (S) for 600 subjects in 30 groups between the ages of 8 and 87 years. All subjects received 320 trials on a Discrimination Reaction Time apparatus. Hull's equation $R = m(1 - e^{-AT}) + c$ was found capable of describing all 30 acquisition curves with an average predictability of 97.98% when the asymptote (m), rate (t), and R-intercept (c) parameters were varied jointly. When m and c were held constant for each sex and only t varied, the average predictability dropped to 64.76%, indicating that rate alone was inadequate to account for variance due to age and sex. Confirming and extending the classical age-performance data, acquisition speeds followed differential trends for both age and sex variation while overall proficiency was a nonmonotonic function of age. There was a rapid growth to a maximum level for females at the age of 16 and for males at 20, then a gradual, nonparallel decline into the seventh decade. Males performed significantly faster than females, and all two-factor interactions were significant. Age and sex are critical parameters in human psychomotor learning and performance. The multiplicative law $R = f(T \times A \times S)$ is proposed for the discrimination-reaction task.

A65-80263

CHANGES IN THE CARDIOVASCULAR SYSTEM DURING ACCLIMATIZATION IN THE INTRACONTINENTAL REGION OF ANTARCTICA.

I. I. Tikhomirov (Moscow Med. Stomatol. Inst., Dept. of Normal Physiol., USSR).
(*Bulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 56, Dec. 1963, p. 28-31).
Bulletin of Experimental Biology and Medicine, vol. 56, Dec. 1963, p. 1319-1326. 10 refs.

Observations were carried out at the Soviet Antarctic Station located in the region of the South Geomagnetic Pole. The leading factors affecting the body state were low air temperatures, low atmospheric pressure, prolonged polar night, and isolated localization of the winter settlement. During the first six months there were many complaints, including palpitations and pain in the cardiac area. With the appearance of the polar day, the number of complaints exhibited a considerable drop. In most persons observed there were enlargement of the heart and murmurs. Systolic, diastolic, and pulse pressure decreased for the whole period of stay in the Antarctic, especially during the polar night. The pulse considerably quickened during the first days of the stay, then rapidly dropped to the initial level. Reaction to physical load (pulse acceleration, the rise in arterial pressure, restitution time) was especially marked at first, later less so. A one-year stay is inadequate for complete acclimatization in the Antarctic Continent.

A65-80264

ON THE REASONS FOR THE PROTECTIVE ACTION OF BACTERIAL ANTIGENS IN ACUTE RADIATION SICKNESS.

M. I. Ravich-Shcherbo and L. G. Prokopenko (Kursk Med. Inst., Dept. of Biochem., USSR).
(*Bulletin' Eksperimental'noi Biologii i Meditsiny*, vol. 56, Dec. 1963, p. 36-38).
Bulletin of Experimental Biology and Medicine, vol. 56, Dec. 1963, p. 1327-1329. 9 refs.

Reasons for the protective action of bacterial antigens on the production of antibodies against human serum proteins, associated with irradiation of rabbits with γ -rays of Co^{60} in a dose of 1000 r, were investigated. In the first series of experiments, the animals were injected subcutaneously, in the right thigh, with 500 million microbial bodies of *B. paracoli*, 48 hours prior to irradiation. After 24 hours, immunization was begun with the proteins of human serum, carried out in two subcutaneous injections in the left thigh with a 10-day interval between. In the second series of experiments, immunization with both antigens was carried out according to the same schema, but using the same extremity for both. The third series of experiments differed from the first by a double injection of the vaccine of *B. paracoli*, 12 and 2 days before the irradiation. The concentration of antibodies against *B.*

paracoli that were formed up to the moment of irradiation did not change after γ -irradiation. Agglutination against *B. paracoli*, in the rabbits of the first and second series of experiments, was observed only in the lymph nodes that were regional to the site of immunization. Antibodies against human serum proteins, in animals of all series of experiments, were noted only in the serum and in the regional lymph nodes. A comparison of the dynamics of antibody accumulation and plasmacytic reaction in the regional and remote lymph nodes facilitated the conclusion that the cause of the protective effect of preliminary immunization lies in the increased number of plasmacytes in the lymph nodes caused by this immunization.

A65-80265

EFFECT OF VITAMIN P ON ASCORBIC ACID METABOLISM IN ANIMALS TEMPORARILY EXPOSED TO A HIGH ENVIRONMENTAL TEMPERATURE.

A. Ya. Tseitina (Res. Inst. of Vitaminol., Lab. of Vitamins C and P, Moscow, USSR).
(*Bulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 56, Dec. 1963, p. 52-55).
Bulletin of Experimental Biology and Medicine, vol. 56, Dec. 1963, p. 1344-1346. 15 refs.

The effect of vitamin P preparations (rutin or tea catechins) on ascorbic acid metabolism of animals that can synthesize vitamin C (albino rats) and those incapable of synthesizing vitamin C (guinea pigs) receiving 25 mg of vitamin C daily for 3 to 4 weeks prior to exposure to one period of overheating (temperature of 40 to 42° and relative humidity of 26 to 31%) was investigated. The overheating took place in an incubator fitted with a device for ensuring circulation of air. The animals were divided into four groups (each containing 10 to 20 subjects). The animals in the first (control) group were kept at 20 to 22°. Those in the second, third, and fourth groups were overheated as described above, and in addition the animals in the third group received rutin, and those in the fourth group received catechins (rats 5 mg each, guinea pigs 10 mg each, daily). The single exposure to the high temperature for 1 hour caused a marked, statistically significant decrease in the ascorbic acid content in the adrenals and liver in animals not receiving vitamin P. In animals receiving tea catechins, practically no decrease in ascorbic acid of the test organs could be observed. Explanations of these results are attempted.

A65-80266

A METHOD FOR THE COMBINED STUDY OF TEMPERATURE, PRESSURE, AND GASEOUS COMPOSITION OF THE SUBCUTANEOUS BULLAE FORMED IN HIGH-ALTITUDE TISSUE EMPHYSEMA.

E. A. Kovalenko and E. V. Vinogradov.
(*Bulleten' Eksperimental'noi Biologii i Meditsiny*, vol. 56, Dec. 1963, p. 109-111).
Bulletin of Experimental Biology and Medicine, vol. 56, Dec. 1963, p. 1394-1397.

The three main factors concerned in high-altitude emphysema are temperature, pressure, and gaseous composition of the subcutaneous bullae. A new method is suggested that enables investigations to be carried out by means of a needle containing a styler thermometer, a set of vacuum burettes, a three-way tap, and a kymograph. Several experiments were carried out by this method at pressures down to 7 mm Hg. It was found that the temperature falls during the development of the bullae, whereas the pressure remains constant. The method may be applied to various species of animals, including rats, cats, rabbits, and dogs.

A65-80267

SOLAR RETINITIS.

R. B. L. Gupta and K. S. Mehra (Gandhi Eye Hosp., Allgarh, India).
Journal of the Indian Medical Association, vol. 43, Sep. 16, 1964, p. 268-270. 6 refs.

Sixty-six cases of solar retinitis in patients looking at a solar eclipse were observed. Only one symptom was found common to all, i.e., fogging of vision. Gross fundus changes were correlated to gross visual damage, but mild fundus changes were not necessarily linked to mild symptoms. The fovea almost invariably escaped the lesion, and a possible explanation is given. Effects of tolazoline (priscol) in one group and dexamethasone along with tolazoline in another were studied. It is suggested that the dexamethasone with tolazoline has beneficial effects on solar retinitis.

A65-80268

DAILY PHYSIOLOGICAL RHYTHMS OF CARNIVORES EXPOSED TO EXTREME CHANGES IN ARCTIC DAYLIGHT.

G. Edgar Folk, Jr. (Iowa U., Dept. of Physiol., Iowa City).
Federation Proceedings, vol. 23, Nov.-Dec. 1964, p. 1221-1228. 9 refs.
Arctic Inst. of North America and NSF supported research.

Experiments are described in which the daily activity of Arctic ground squirrels and carnivores were recorded by radio capsules which register physiological function. These animals were studied both when the light of the Arctic was continuous and when a daily clue of sunrise and sunset

was present (August and September). A series of eight of each type of animal showed fixed activity patterns which had slight variation from day to day but did not show a moving activity peak which varied systematically in the same direction. It is suggested that in continuous light these animals demonstrated a fixed activity pattern which was circadian and synchronized with sun time. A possible regular clue from the physical environment during the period of continuous light which would regulate the activity of the carnivores and ground squirrels is discussed. The position of the sun as a possible clue to the animals for maintaining the fairly precise circadian rhythms is also discussed.

A65-80269

AN ESSAY ON COLOR VISION AND CLINICAL COLOR-VISION TESTS. Arthur Linksz (N. Y. U., Post-Graduate Med. School; and Manhattan Eye, Ear and Throat Hosp., N. Y.) New York, Grune and Stratton Inc., 1964, xviii+254 p. 206 refs.

A comprehensive treatment of color vision is presented with emphasis on a functional interpretation of color perception. The monograph includes clinical diagnostic tests of color anomalies, genetic aspects of color vision defects as well as acquired color vision defects. Some related subjects such as color photography, color television, color reproduction, and Land's experiments (1959) on the two color projection phenomena are also covered. Sensory physiology of color vision and/or neurophysiological theories of color vision are not included.

A65-80270

ADAPTATION AND FATIGUE.

Weldon Selters (Res. Center, Subcomm. on Noise, Los Angeles, Calif.) *Journal of the Acoustical Society of America*, vol. 36, Nov. 1964, p. 2202-2209. 12 refs. PHS supported research.

Any audible tone produces measurable changes in the response of the ear to subsequent stimulation. With exposures up to about 70 decibels (dB) response changes can be attributed entirely to neural adaptations. At higher levels, fatigue adds to adaptation. These processes have been separately identified by temporary threshold shift (TTS) experiments showing adaptation as primarily a reduction in loudness response and fatigue as primarily a reduction in sensitivity. Adapted ears will show a TTS of 5 to 10 dB when the threshold is obtained by interpolation between audible and subaudible stimuli, but trained observers tested by a method that minimized the effect of loudness showed only 1 dB TTS.

A65-80271

CHANGES IN TONE OF LIMB VEINS DURING SUPINE EXERCISE.

B. Sture Bevegard and John T. Shepherd (Mayo Clin. and Mayo Found., Sect. of Physiol., Rochester, Minn.) *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 1-8. 28 refs. NIH Grant HE-5883.

Normal subjects were studied to assess the response of the capacitance vessels in the forearm during supine leg exercise. Measurements were made of the changes in forearm volume (strain-gage and water-filled plethysmographs) at a given pressure in the large forearm veins, of changes in pressure in the forearm veins with the circulation to the forearm arrested, and in isolated vein segments. The results were consistent and demonstrated that exercise with a workload of 270-810 kg/min caused constriction of forearm capacitance vessels via the sympathetic nerves proportional to the severity of the exercise. Venoconstriction also occurred in the hand, and in the calf during arm exercise. Local exercise of the forearm muscles during the resistance vessels, did not prevent the increase in venous tone in the forearm. Thus a reflex increase in tone in the limb veins, both in the exercising and in the nonexercising parts, contributes to the cardiovascular adaptation to exercise.

A65-80272

OXYGEN USED IN HORIZONTAL AND GRADE WALKING AND RUNNING ON THE TREADMILL.

D. B. Dill (Ind. U., Dept. of Anat. and Physiol., Bloomington). *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 19-22. 15 refs. PHS Grant CD 00056-01.

The net oxygen cost of level and grade running was determined in three men—the author and two champion runners. The horizontal costs for the three were in agreement at the lower rates and for the two runners at high rates. A curve enables one to estimate the cost of horizontal walking and running and also of the horizontal component of grade walking and running. With this as a basis the cost of the vertical component in grade walking was found to be 1.53 ml/mkg for the author and 1.31 ml/mkg for one of the runners in both walking and running. This latter value and the curve relating the cost of the horizontal component to the rate of walking and running were used to estimate the cost of grade walking and running for seven other champion runners. The estimates checked closely with the observed cost in five. Marathoner DeMat was more efficient and the seventh runner was less efficient than predicted.

A65-80273

ROLE OF SKIN AND OF CORE TEMPERATURES IN MAN'S TEMPERATURE REGULATION.

C. H. Wyndham (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 31-36. 17 refs.

The response characteristics have been studied of the curves relating heat conductance and sweat rate to change in rectal temperature at different levels of skin temperature, and vice versa. The increase in these responses with deviation in rectal temperature from the neutral setting is highly nonlinear; the neutral point and the curve shift to the right, and the slope decreases with lowering of skin temperature and vice versa when it is raised. With further deviation of rectal temperature these responses reach maximum values, i.e., become saturated. All of these features are analogous to servomechanisms with negative feedback, giving sensitive and stable control. Control of these responses by skin temperature is more linear, characterizing passive control systems that are insensitive and less stable. Quantitatively, the effect at skin temperature of 26°C of 1°C rise in rectal temperature on heat conductance and sweat rate is 10 times greater than the same rise in skin temperature; at a neutral skin temperature of 33° to 34°C , a rise of 1°C in rectal temperature is 6 to 7 times greater; at a high skin temperature of 36°C , a rise in rectal temperature of 1°C is 4 to 5 times greater.

A65-80274

CRITERIA FOR PHYSIOLOGICAL LIMITS FOR WORK IN HEAT.

C. H. Wyndham, N. B. Strydom, J. F. Morrison, C. G. Williams, G. A. G. Bredell, J. S. Maritz, and A. Munro (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab. and Math. Statist. Div., Johannesburg, South Africa). *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 37-45. 16 refs.

New physiological criteria are put forward for setting the limits for men at work in hot conditions. They are based upon the fact that the curves relating rectal temperatures to conductances and rectal temperatures to sweat rates have two components. One is where the increases in the sweat rates and conductances, with rise in rectal temperature, are relatively larger, i.e., there is a sensitive range of control; the second is where the curves of sweat rates and conductances against rectal temperatures reach asymptotes, i.e., become saturated. The upper limit of the sensitive range is a rectal temperature of 100.5°F (38.1°C), and the saturated range begins at rectal temperatures of 102.5°F (39.4°C). These concepts explain the easy, difficult, or excessive ranges of conditions of the Fort Knox and Human Sciences Laboratory studies. The great advantage of these criteria over others proposed is that the extent of the physiological strain on the workmen can be assessed directly and simply by a measurement of oral or rectal temperatures during the shift, and from these results limits for work can be set for work at specific hot jobs.

A65-80275

PHYSICAL INSULATION OF HEALTHY MEN AND WOMEN OVER 60 YEARS.

Dae Yon Lee, (Yonsei U. Coll. of Med., Dept. of Physiol., Seoul, Korea; and N. Y. State U., Dept. of Physiol., Buffalo) Suk K. Hong, and Pyung Hee Lee *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 51-55. 9 refs. Yonsei U. Coll. of Med. supported research. NSF Grant G-24044.

Maximal body insulation [$I = (\text{rectal temp.} - \text{skin temp.}) / \text{rate of skin heat loss}$] of healthy Korean men and women (17 each) over 60 years of age was determined by a method applied earlier to diving women of Korea (Rennie et al. *J. Appl. Physiol.* 17:961, 1962). The critical water temperature was similar for males and females, ranging from 28° to 33°C . The water temperature at which 50% of subjects shivered was 31.2°C for both groups. This value is identical to that of young Korean men but is significantly higher than that of young Korean women. When a comparison was made at 31°C water, the extent of reduction in rectal temperature was, in the aged group, greater in males than in females, and was also greater in the aged than in the young. However, these differences could be accounted for mostly by the difference in subcutaneous fat thickness. When the values of I were considered as a function of the subcutaneous fat thickness, there was no difference either between old males and females or between the aged and young Korean subjects. This indicates that maximal body insulation due to physical factors does not change as a function of age.

A65-80276

ELEVATION OF BODY TEMPERATURE IN HEALTH.

David Minard, Louis Copman, and A. R. Dasler (Naval Med. Res. Inst., Bethesda, Md.) *Annals of the New York Academy of Sciences*, vol. 121, Oct. 9, 1964, p. 12-25. 29 refs.

Patterns of internal temperature measured simultaneously in the rectum (t_r), lower esophagus (t_o), and at the tympanum (t_e) of normal subjects at thermal equilibrium during rest and work and in transient states of body heating and cooling induced by changes in metabolic rate or environmental heat stress. In all experiments, skin temperature (t_s) was measured at 10 points by thermocouple junctions attached to fine mesh copper screen placed in close contact with the skin. These points were the forehead, chest, abdomen, upper arm, hand, inner thigh, outer thigh, calf, and foot. During exposure to

heat loads that result in transient heat storage and during the subsequent recovery period, indices of heat strain such as heart rate tend more nearly to parallel rates of temperature change in the more responsive regions. It is concluded that t_0 and t_e are more sensitive indicators of changes in internal temperature than is t_r during transient heat storage, and t_r is a more reliable index of time of thermal equilibrium than are t_0 or t_e .

A65-80277

HEMODYNAMIC ALTERATIONS DURING ACUTE CARBON MONOXIDE POISONING [MODIFICAZIONI EMOdinamiche DURANTE L'INTOSSICAZIONE ACUTA DA MONOSSIDO DI CARBONIO].

Giovanni Francesco Rubino (Turin U., Ist. di Med. del Lavoro, Italy). *Rassegna di Medicina Industriale e di Igiene del Lavoro*, vol. 33, May-Aug. 1964, p. 268-274. In Italian.

In dogs poisoned with 0.8% to 2% carbon monoxide the cardiac frequency increased, and the systemic blood pressure increased slightly. Pulmonary artery pressure increased two and even three times as much. An aspect of the autonomy of coronary circulation advanced the hypothesis that responsibility for pathogenesis of chronic pulmonary heart disease is not due to decreased alveolar oxygen tension but to decreased blood oxygen content.

A65-80278

STUDY OF THE "EXCITATION-DURATION" CURVES AFTER ACUTE OCCUPATIONAL MONOXIDE POISONING [ETUDE DES COURBES "EXCITATION-DUREE" APRES INTOXICATION AIGUE PROFESSIONNELLE PAR L'OXYDE DE CARBONE].

Jean Paris.

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 275-291. In French.

By means of an electric rheotome, excitation-duration curves of the anterior leg muscle and external popliteal sciatic nerve were obtained from seven workers accidentally acutely poisoned by carbon monoxide. The changes in excitability duration curves found after carbon monoxide poisoning were characterized by significant hypoexcitability of the nerve with relative inversion of the nerve-muscle excitability ratio. Inversion of this type renders objective the subjective clinical syndrome of muscular asthenia and weakness of the lower limbs that is observed after acute carbon monoxide poisoning. Included are representative graphic curves of excitation-duration obtained from the subjects.

A65-80279

KINETICS OF THE REACTION OF HUMAN HEMOGLOBIN WITH CARBON MONOXIDE [CINETICA DELLA REAZIONE DELL'EMOGLOBINA UMANA CON L'OSSIDO DI CARBONIO].

Eugenio Meda (Turin U., Ist. di Fisiol. Gen., Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 292-295. 6 refs. In Italian.

Results are presented of studies on the kinetics of the reaction of human hemoglobin with carbon monoxide that were obtained by means of the interrupted flow method. The effect of temperature on the kinetics of the reaction was also determined and an equation given for calculating the constant speed.

A65-80280

ON THE DIAGNOSIS OF CHRONIC CARBON MONOXIDE POISONING [ZUR DIAGNOSTIK DER CHRONISCHEN KOHLENOXYDVERGIFTUNG].

Hans Zorn.

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 325-329. In German.

A group of workers were studied who worked in a noisy environment while exposed to low concentrations of carbon monoxide over a relatively long period of the time due to an unnoticed gas leak. Examinations and psychological tests compared to those previously made showed an increase in the excitability and irritability to noises. The percentage of carboxyhemoglobinemia varied between 10% and 20%. The electroencephalogram revealed a picture of extremely unstable frequency. After elimination of the gas leak the tests returned to normal—after eight weeks in young subjects and after sixteen weeks in elderly and old subjects. It is recommended that a series of examinations and tests be given to workmen at intervals of three to four years in order to follow-up the action of subtoxic carbon monoxide concentrations.

A65-80281

ORGANIZATION OF AN ARTIFICIAL RESPIRATION CENTER: THERAPY OF ACUTE CARBON MONOXIDE POISONING [ORGANIZZAZIONE DI UN CENTRO DI RIANIMAZIONE RESPIRATORIA: TERAPIA DELL'INTOSSICAZIONE ACUTA DA OSSIDO DI CARBONIO].

Enrico Clocatto and Roberto Pattono (Turin U., Ist. di Anestesiol. e Rianimazione, Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 330-333. In Italian.

The emergency treatment of carbon monoxide poisoning and other types of poisoning is generally relatively simple to carry out, but is handicapped in practice by organizational difficulties. A brief outline is given of the different problems regarding the medical staff and auxiliaries, the emergency

wards and equipment, and the transportation of poisoned subjects. All of these points are of basic importance for the organizational function of an artificial respiration and cardiovascular center in a big industrial town.

A65-80282

ON THE TREATMENT OF ACUTE CARBON MONOXIDE POISONING WITH OXYGEN THERAPY IN A PRESSURE CHAMBER [SULLA CURA DELL'OSSICARBONISMO ACUTO MEDIANTE OSSIGENOTERAPIA IN CAMERA PRESSURIZZATA].

Francesco Molfino and Damiano Zannini (Genova U., Ist. di Med. del Lavoro, Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 334-336. In Italian.

Three cases of carbon monoxide poisoning were treated with pure oxygen in a pressure chamber. This method not only provides good tissue oxygenation, but as regards carboxyhemoglobinemia, 50% desaturation is attained in about half the time required to reach the same reduction with oxygen at normal pressure.

A65-80283

EXPERIENCES IN THE TREATMENT OF ACUTE CARBON MONOXIDE POISONING [ESPERIENZE IN TEMA DI TRATTAMENTO DELL'OSSICARBONISMO ACUTO].

Raoul Beghe.

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 337-351. In Italian.

Experiences with 16 cases of acute carbon monoxide poisoning are presented, which were treated in artificial-respiration wards of Rome hospitals. The cases are clinically subdivided into three groups according to the degree of nervous, cardiovascular, and respiratory dysfunction. A review is included of the therapeutic procedures used during respiratory resuscitation (oxygen therapy), cardiovascular resuscitation, and drug therapy (vitamin C, hexaphosphene, cocarboxylases). Antibiotics are also administered to carbon-monoxide poisoned patients in order to prevent the frequently occurring complication of respiratory infection. It is advocated that departments be set up in hospitals to handle emergency treatment of carbon monoxide poisoning.

A65-80284

FERROUS THERAPY IN ACUTE CARBON MONOXIDE POISONING [LA TERAPIA FERROSA NELL'OSSICARBONISMO ACUTO].

Luigi Pecora (Naples U., Ist. di Med. del Lavoro, Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 352-353. In Italian.

In experiments, rabbits poisoned with carbon monoxide showed hypochromic anemia, increased enzymatic erythrocytic activity, decreased iron in bone, muscle, liver, lung, and spleen tissue, and an increased urinary elimination of iron. On this basis, 62.5 mg of iron was injected intravenously into acutely poisoned humans. Symptomatology regressed rapidly as did the blood level of carboxyhemoglobin, demonstrating that in addition to producing a condition of asphyxia, carbon monoxide also exerts a true toxic action.

A65-80285

EFFECTS ON THE SICK AND ACCIDENT RATES IN SUBJECTS EXPOSED TO THE RISK OF CHRONIC CARBON MONOXIDE POISONING [ASPETTI DELLA MORBILITA E DELLA INFORTUNABILITA NEI SOGGETTI ESPOSTI A RISCHIO DI OSSICARBONISMO CRONICO].

Salvatore Fiandaca and Ermanno Vercellotti.

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 360-379. In Italian.

A statistical survey was made of the sickness and accident rate in a population of workers exposed to the risk of chronic carbon monoxide poisoning. A constant increase was found in the accident rate, and an increase was also found in the sickness rate, which was only statistically significant in relation to the relapses of the number of subjects who were smokers. The increased accident rate was probably due to the momentary action of the high level of carboxyhemoglobinemia. A direct causal relationship may be found in the sickness increases and in the short indispositions identified in subjective symptomatology with those due to sudden increased environmental carbon monoxide concentrations, along with cigarette smoke.

A65-80286

STATISTICAL STUDY OF THE INCIDENCE OF CERTAIN CLINICAL SIGNS DURING THE COURSE OF ACUTE CARBON MONOXIDE POISONING, AND THEIR IMMEDIATE PROGNOSTIC VALUE [ON 4952 OBSERVATIONS OF ACUTE INTOXICATION] [ETUDE STATISTIQUE DE LA FREQUENCE DES CERTAINES MANIFESTATIONS CLINIQUES AU COURS DE L'INTOXICATION AIGUE PAR L'OXYDE DE CARBONE LEUR VALEUR PRONOSTIQUE IMMEDIATE (A PROPOS DE 4952 OBSERVATIONS D'INTOXICATIONS AIGUES)].

R. Ch. Francois and M. Bertin.

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 380-391. In French.

A statistical analysis is made on 4952 cases of acute carbon monoxide poisoning that were observed over a 4-year period. The incidence of the following clinical manifestations, which may be of value for immediate prognosis, are outlined: state of consciousness; neurological, mental, respiratory, and cardiovascular symptoms; face color (cyanosis); loss of urine; digestive and abdominal disorders; and hyperthermia.

A65-80287

RADIAL PARALYSIS IN A CASE OF ACUTE CARBON MONOXIDE INTOXICATION [PARALISI DEL RADIALE IN UN CASO DI INTOSSICAZIONE ACUTA DA OSSIDO DI CARBONIO].

Luca Tronzano and Giancarlo Coscia (Turin U., Ist. di Med. Legale e delle Assicurazioni, Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 401-403. In Italian.

A case is reported of paralysis of the right arm in a 38-year-old worker acutely poisoned by carbon monoxide. The paralysis persisted for three months, although no signs of central-nervous-system distress were evident. This case demonstrates the occurrence of isolated lesions in the peripheral nerve trunks of the arm during acute carbon monoxide poisoning.

A65-80288

VALUE AND SIGNIFICANCE OF FIBRINOLYSIS IN EXPERIMENTAL CARBON MONOXIDE POISONING [VALORE E SIGNIFICATO DELLA FIBRINOLISI NELL'OSSICARBONISMO SPERIMENTALE].

Francesco Candura and Angelo Craveri (Pavia U., Ist. di Med. del Lavoro, Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 404-406. In Italian.

Based on observations of the fluidity of blood in cases of fatal asphyxia, a study was made on the behavior of fibrinolysis in animals acutely poisoned with carbon monoxide. Increased fibrinolysis was found only in vivo, even in animals poisoned after removal of the adrenal glands. Splenectomy, however, prevented the occurrence of this phenomenon indicating two hypotheses: carbon monoxide poisoning causes (1) the liberation of hypoxilinene, which is capable of orienting blood coagulation towards hypocoagulability and has a profibrinolytic action, and (2) the emission in the circulation of splenin B, which is capable of profibrinolytic activity.

A65-80289

ELECTROCARDIOGRAPHIC ALTERATIONS IN CASES OF ACUTE CARBON MONOXIDE POISONING [ALTERAZIONI ELETTROCARDIOGRAFICHE IN CASI DI INTOSSICAZIONE ACUTA DA OSSIDO DI CARBONIO].

Mauro Mainardi.

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 420-429. In Italian.

A study was made during the past 10 years of electrocardiographic alterations in persons acutely poisoned with carbon monoxide. The alterations appear to be due not only to the anoxic action of carbon monoxide but also to a cytotoxic one. The latter was demonstrated by the increase in transaminases, and especially the increase in lactic dehydrogenase, even in cases where the damage was transient.

A65-80290

HYPOTHERMIA IN TREATMENT OF ACUTE CARBON MONOXIDE POISONING (CONSIDERATIONS ON A CLINICAL CASE) [L'IPOTERMIA NELLA RIANIMAZIONE DELL'AVVELENAMENTO ACUTO DA OSSIDO DI CARBONIO CONSIDERAZIONI SU UN CASO CLINICO].

Oswaldo Zaffiri (Turin U., Ist. di Anestesiologia e Rianimazione, Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 433-436. 7 refs. In Italian.

A case is reported of acute carbon monoxide poisoning treated with hypothermia to 32°, and with recovery of the patient without sequelae after 5 days in a coma. The decreased metabolic requirements during hypothermia provide a good oxygen supply to the cerebral, hepatic, cardiac, and renal tissue, thus defending them from the action of hypoxia. Moreover, the hemoglobin dissociation curve is displaced to the left. From a theoretical viewpoint, hypothermia appears to be the most rational treatment to avoid hypoxia of the nervous and cardiovascular systems and the resultant sequelae in those who survive the coma of carbon monoxide poisoning.

A65-80291

THE BEHAVIOR OF GLUTATHIONE, STABLE GLUTATHIONE AND GLUCOSE-6-PHOSPHATE-DEHYDROGENASE IN SUBJECTS EXPOSED TO CHRONIC INHALATION OF CARBON MONOXIDE [IL COMPORTAMENTO DEL GLUTATHIONE DEL GLUTATHIONE STABILE E DELLA GLUCOSIO-6-FOSFATO-DEIDROGENASI IN SOGGETTI ESPOSTI AD INALAZIONE CRONICA D'OSSIDO DI CARBONIO].

G. C. Coscia, G. Perrelli, P. C. Gaido, and F. Capellaro (Turin U., Ist. di Clin. Med. Gen. e Terap. Med., Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 446-451. 29 refs. In Italian.

Nineteen subjects between 44 and 56 years of age working with illuminating gas were given supraliminal inhalations of carbon monoxide. A study of erythrocytic glutathione and glucose-6-phosphate dehydrogenase revealed that in six subjects with carboxyhemoglobinemia above normal a decrease of the glutathione level was found. Glucose-6-phosphate dehydrogenase decreased in seven cases. Comparison of average values obtained from a group of normal subjects showed no significant statistical differences.

A65-80292

ACID-BASE EQUILIBRIUM IN EXPERIMENTAL ACUTE CARBON MONOXIDE POISONING [EQUILIBRIO ACIDO-BASE NELL'INTOSSICAZIONE ACUTA SPERIMENTALE DA OSSIDO DI CARBONIO].

G. Marchiaro, E. Margaria, P. C. Gaido, and G. Aquaro (Turin U., Ist. di Anestesiologia e Rianimazione, and Clin. Med. Gen., Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 452-453. In Italian.

In dogs poisoned with 0.8% to 2% carbon monoxide, a progressive decrease was found in the blood pH values accompanied by an increase in the carbon dioxide tension. Plasma bicarbonate ions decreased slightly. The state of acidosis was partially corrected during successive stages of treatment.

A65-80293

DYNAMICS OF THE ELIMINATION OF CO IN VARIOUS RESUSCITATION CONDITIONS [DINAMICA DELLA ELIMINAZIONE DEL CO IN VARIE CONDIZIONI DI RIANIMAZIONE].

R. Pattono, G. Marchiaro, F. Capellaro, and G. Orione (Turin U., Ist. di Anestesiologia e Rianimazione, and Clin. Med. Gen., Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 456-457. In Italian.

Elimination of carbon monoxide was studied under various conditions of resuscitation in dogs poisoned with 0.8% to 2% carbon monoxide. During treatment with air, the carboxyhemoglobinemia dropped 40% in 20 minutes; with controlled pure oxygen positive and negative pressure breathing it dropped faster; and with breathing oxygen and air, simultaneously with hypothermia to 32°, carbon monoxide elimination showed an intermediate trend.

A65-80294

HEMODYNAMIC VARIATIONS IN EXPERIMENTAL ACUTE CARBON MONOXIDE POISONING (VARIAZIONI EMODINAMICHE NELLA INTOSSICAZIONE SPERIMENTALE DA CO).

M. Querci, F. Margaglia, G. Orione, and G. Acquaro (Turin U., Ist. di Anestesiologia e Rianimazione, Clin. Chirurgica Gen., and Clin. Med. Gen., Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 454-455. In Italian.

The inhalation of 0.8% to 2% carbon monoxide by dogs produced an increase in cardiac frequency with simultaneous increase in systolic pressure. The latter decreased progressively when carboxyhemoglobinemia values reached about 10%. The marked progressive increase of pulmonary artery pressure was probably due not so much to a decrease of alveolar oxygen tension but to a decrease of blood oxygen.

A65-80295

MECHANISM OF THE TOXIC ACTION OF CO AND RESULTING THERAPEUTIC PRINCIPLES [MECCANISMO DELL'AZIONE TOSSICA DA CO E PRINCIPII TERAPEUTICI CONSEGUENTI].

Giorgio Torelli (Milan U., Ist. di Fisiol. Umana, Italy).

Rassegna di Medicina Industriale e di Igiene del Lavoro, vol. 33, May-Aug. 1964, p. 458-464. 21 refs. In Italian.

The toxic action of carbon monoxide is attributed to anemic anoxia, and to the difficult distribution of blood oxygen to the tissues due to Haldane's effect. These factors indicate that the administration of pure oxygen be used in treating patients subjected to high artificial hyperventilation. Therapy should be applied as soon as possible in order to minimize the damage done by anoxia during the first minutes of poisoning.

A65-80296

INTERPLANETARY VOYAGES, A NECESSITY FOR HUMANITY [LES VOYAGES INTERPLANETAIRES, UNE NECESSITE POUR L'HUMANITE].

C. J. Macris (Nat. Obs., Athens, Greece).

Scientia, vol. 58, Jun-Jul. 1964, p. 108-113. In French.

There are many answers to the question, "Why does man spend time and money to make interplanetary voyages?" Human efforts can be attributed to thirst for knowledge, to motives purely material and economic, and to interest in preservation of the human species. The third reason is more important than the other two reasons. Man wants to preserve his species, consequently he is always fighting against nature and the rest of the organic world. After billions of years, the earth will not be habitable because the sun will become too hot and cause transmutations of hydrogen and helium, whereby a deficiency of mass is transformed into energy. In the near future temperature of the day star will increase to a great degree so that the sun's brilliance will increase about one hundred times in relation to its brilliance today. Thus the earth's temperature will attain 300 degrees. Under these conditions, life will become

problematic and man will seek to emigrate to other planets less exposed to solar heat. Man strives for final victory, and in this case, victory signifies successful interplanetary voyages, which are necessary for human life.

A65-80297

THE ORIGIN OF LIFE AS A PROBLEM OF THE FORMATION OF MACROMOLECULES. III. L'ORIGINE DELLA VITA COME PROBLEMA DELLA FORMAZIONE DI MACROMOLECOLE (TERZA PARTE).

F. Cedrangolo (Naples U., Ist. di Chim. Biol., Italy).

Scientia, vol. 58, Jun.-Jul. 1964, p. 123-131. 77 refs. In Italian.

Following a brief discussion of the possibility of life on other planets, it is concluded that the first living thing was a large molecule equipped with the power of autoduplication in the presence of a very simple molecule and capable of protein synthesis, which appears to be the substance of living matter. In other words the first form of life was derived from a macromolecule which was possibly of generic or viral type. Fundamental objections to this hypothesis are presented and evaluated.

A65-80298

RENAL EXCRETION OF BICARBONATE IN HIGH ALTITUDE NATIVES AND IN NATIVES WITH CHRONIC MOUNTAIN SICKNESS.

Carlos Monge C., Rodolfo Lozano, and Amador Carcelén (Peruvian U. of Med. and Biol. Sci., High Altitudes Res. Inst., Lima, Peru).

Journal of Clinical Investigation, vol. 43, Dec. 1964, p. 2303-2309. 25 refs. NIH Grant GM 08576.

When compared with sea level controls, natives from high altitudes (4300 meters above sea level) have lower arterial P_{CO_2} and the same renal maximal reabsorption (T_m) of bicarbonate. Natives with chronic mountain sickness have a higher arterial P_{CO_2} than their own native control group and a higher bicarbonate T_m . The results are interpreted as indicating that the normal high-altitude native is in a new state of acid-base equilibrium. The possible roles of high arterial P_{CO_2} , hypokalemia, and anoxia in the elevation of bicarbonate T_m of patients with chronic mountain sickness are discussed.

A65-80299

SPACE MEDICINE.

John J. Bunting (Baylor U., Coll. of Med., Houston, Tex.)

Medical Record and Annals, vol. 57, Oct. 1964, p. 515-516.

Effects of weightlessness and acceleration on eating, drinking, deglutition, and micturition during space flight are reviewed. Neither weightlessness nor patterns of accelerations likely to be encountered in space flight appear to constitute a serious threat to the astronauts' capabilities. However, Von Beckh has expressed some apprehension regarding a combination of the two, since his studies suggest that thresholds of injury from accelerative forces may be lower under space flight conditions than in normal flight. The most significant limiting factor to prolonged flight, in the view of Soviet investigators, is the ability of the cardiovascular system to adapt to the new environment. They believe that at present astronauts could not function adequately in space flight for more than 14 days. Since weightlessness appears to be the prime obstacle, the Russians feel it may be necessary to introduce artificial gravity during prolonged flights.

A65-80300

THE EFFECT OF TRUE AND FALSE KNOWLEDGE OF RESULTS ON THE DETECTABILITY OF SIGNALS IN A VIGILANCE TASK.

Jane F. Mackworth (Defence Res. Med. Labs., Toronto, Canada).

Canadian Journal of Psychology, vol. 18, Jun. 1964, p. 106-117. 15 refs.

Comparisons were made between the effects of knowledge of results (KR), false knowledge of results (FKR), and no knowledge (NK) on the detection of a brief pause in the movement of a clock hand. Seven groups of about 14 subjects were employed. The effect of telling subjects that they had missed a signal was tested during the run and in later NK runs. The percentages of signals detected and of false alarms were measured, and d' estimated. The results were similar for both percent detected and for d' . The best performance and least decrement were found with KR. With FKR the overall level was intermediate, but the rate of decrement was the same as with NK. Performance with NK was improved following KR, and slightly improved following FKR. It is suggested the subjects learn both the temporal pattern and the characteristics of the signal.

A65-80301

VARIATION OF PLASMA KETONES AND FREE FATTY ACIDS DURING ACUTE COLD EXPOSURE IN MAN.

Peter G. Hanson and Robert F. Johnson (Ill. U., Dept. of Physiol. and Biophys., Human Environ. Res. Unit, Urbana).

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 56-60. 28 refs. Contract DA-49-193-MD-2222.

The magnitude of ketosis induced during acute cold exposure was studied. Plasma and urinary ketone bodies and plasma free fatty acids (FFA) were followed in four healthy young men at rest during a 90-min period of semineutral exposure of 0°C in still air. This period was followed by 4 hours of recovery at 25°C . Each subject served as his own control throughout an experimental sequence in which one cold-exposure and corresponding control period

(25°C) were experienced each week for 3 successive weeks. The subjects were in a fasting state but with water ad libitum beginning 12 hours prior to the experiment. Lightweight clothing was worn during recovery and control periods. The combined group data show a significant increase in plasma FFA during cold exposure as compared with similar control periods. Although true hyperketonemia or hyperketonuria did not develop, the levels of plasma ketones are elevated in the cold-exposure period of the first week. During the second and third week there is no difference between the cold and control plasma ketone concentration. The data suggest that FFA is mobilized as a metabolic substrate during cold exposure and that efficient peripheral utilization of the elevated plasma FFA concentration minimizes hyperketogenesis.

A65-80302

EFFECTS OF IMMERSION OF THE HAND IN COLD WATER ON DIGITAL BLOOD FLOW.

A. C. L. Hsieh, T. Nagasaka, and L. D. Carlson (Ky. U., Dept. of Physiol. and Biophys., Lexington).

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 61-64. 13 refs. Contract AF 41(657)-335.

The temperatures of the tip of the middle fingers (T_s) on nine comfortably warm subjects have been recorded during immersion of all the fingers of one hand in a 27-liter bath containing slowly stirred water at temperatures ranging from 4.6° to 40°C (T_w). Blood flow ($F = \text{ml}/\text{cm}^2$ per min) was estimated from the average T_s for the last 15 min of a 20-min period, T_w and body temperature (T_b) by using the equation: $F = 1.086 \times K(T_s - T_w) / (T_b - T_s)$ ($K = 0.0134 \text{ kcal}/\text{cm}^2$ per min per $^\circ\text{C}$). The increase in F per $^\circ\text{C}$ reduction in T_w below 10°C was 0.16 ± 0.077 ($P < 0.05$). This value gives a measure of the vasodilatation occasioned by immersion in water below 10°C . The sample regression equation of F on T_w was: $F = 4.1 - 0.16 T_w \pm 0.17$ ($n = 27$; range of $T_w = 4.6^\circ$ to 10°C). This method of estimating blood flow at several levels of T_w describes more fully the peripheral circulatory response to cold than methods in which only one level of T_w is used.

A65-80303

IMMEDIATE RESPIRATORY RESPONSE TO SUDDEN COOLING OF THE SKIN.

W. R. Keatinge and J. A. Nadel (Calif. U., School of Med., Cardiovascular Res. Inst., San Francisco).

(Physiological Society, Meeting, London, England, Mar. 23-24, 1962.)

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 65-69. 18 refs. Contract Nonr 222(55); and Natl. Heart Inst. Grant HE0-6285.

Showers at 25°C and below increased ventilation in man, and respiration often could not be controlled voluntarily during showers at near 0°C . The increase took place within seconds and was accompanied by an increase in arterial pO_2 . The response could be obtained from high decerebrate cats and is believed to be a reflex initiated by cold receptors in the skin and mediated at midbrain level. The chest and abdomen were the most sensitive areas in man, but chilling any large area on the trunk or limbs caused some increase in ventilation. Although the showers caused an inspiratory shift in respiration and a sensation of difficulty in breathing, they caused little increase in airway resistance and no decrease in pulmonary compliance.

A65-80304

EFFECTS OF SALICYLATE ON ACCLIMATIZATION TO WORK IN THE HEAT.

David E. Bass and Eugene D. Jacobson (US Army Res. Inst. of Environ. Med., Natick, Mass.)

(Federation of American Societies for Experimental Biology, 47th Annual Meeting, Atlantic City, N.J., Apr. 16-20, 1963.)

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 70-72.

Some effects of daily large doses of sodium salicylate were studied on the pattern of acclimatization to work in the heat. Acclimatization was induced by daily walks of 100 min on a level treadmill at 3.5 mph at $120^\circ/80^\circ\text{F}$ (dry bulb-wet bulb). Two matched groups of six men each were acclimatized in this manner, and one group received 5.9 to 7.8 g of sodium salicylate daily over a period of 10 days. Men treated with salicylate exhibited the same acclimatization process, i.e., their rectal temperatures, skin temperatures, and pulse rates during work in the heat were lower on the later days. Quantitatively, the degree of acclimatization (as measured by rectal temperature) was less in the men receiving salicylate than in the control group. This difference was more apparent than real, however, in that when the salicylate group were taken off the drug regimen, they exhibited the same degree of acclimatization in terms of rectal temperature as did the control group. The acclimatization process did not abolish the acute response to salicylate.

A65-80305

TOLERANCE OF MEN WORKING IN HOT, HUMID ENVIRONMENTS.

P. F. Iampietro and R. F. Goldman (Civil Aeromed. Res. Inst., Physiol. Branch, Oklahoma City, Okla.; and Quartermaster Res. and Engr. Center, Natick, Mass.)

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 73-76. 11 refs.

Tolerance of acclimatized men working in eight hot, humid environments was studied. Results show that the upper limits for completion of 3 hours of

work at a caloric expenditure of 350 kcal/hr are dry bulb (DB) 95° F and wet bulb (WB) 90° F. Rectal temperature is not a good indicator of tolerance under the conditions of our study, whereas skin temperature and heart rate are. A good relationship is evident between the rapid changes in skin temperature during work (first 10 minutes of exposure) and tolerance time; thus, these rapid changes may be used to predict tolerance time. Of the physical indexes of thermal stress the best relationship was established between WD (WD = 0.15 DB and 0.85 WB) and tolerance time.

A65-80306

DISTRIBUTION OF VENTILATION IN NORMAL SUBJECTS FROM 7 TO 45 YEARS OF AGE.

M. M. Orzalesi, M. C. Hart, and C. D. Cook (Harvard Med. School, Dept. of Pediat.; and Children's Hosp. Med. Center, Dept. of Med., Boston, Mass.) *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 77-78. 7 refs. NIH Grants HD-00248-04 and TL-HD-56.

Distribution of ventilation was investigated in 57 normal subjects of both sexes ranging in age from 7 to 45 years using the nitrogen washout method. Normal values for nitrogen clearance delay and the lung clearance index are presented for children and adults. No significant sex- or age-dependent difference was found in either of these parameters. The present data are compared with those in the literature.

A65-80307

EVIDENCE FOR ADRENAL INSUFFICIENCY IN ACUTELY STRESSED CAPTIVE MONKEYS.

Jack P. Nagle, Earl E. Cammock, Lloyd M. Nyhus, and Henry N. Harkins (Wash. U., School of Med., Dept. of Surg., Seattle). *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 131-133. 8 refs. State of Wash. supported research. NIH Grant AM-02187.

A number of postoperative complications in *Macaca nemestrina* suggested possible adrenal insufficiency secondary to chronic stress. Adrenal function was assessed by use of plasma 17-hydroxycorticoids, total eosinophil counts, and ACTH-response tests. Surgery or anesthesia resulted in a rise in plasma 17-hydroxycorticoids and a fall in total eosinophils in the majority of monkeys; all of these animals demonstrated at least a 50% decrease in the total eosinophil count 4 hours following the intramuscular administration of ACTH. However, in three monkeys this type of response did not occur following one or both of the tests that were done. These three animals, unlike the others, presented one or more of the following complications during the poststress period: lethargy, failure to eat properly, diarrhea, and diuresis. These finds indicate that the stress of captivity may deplete adrenal reserve and may alter normal physiological responses.

A65-80308

A SIMPLE METHOD FOR MEASURING TOTAL RESPIRATORY COMPLIANCE: NORMAL VALUES FOR MALES.

R. M. Cherniack and E. Brown (Manitoba U., Dept. of Med., Canada; and Winnipeg Gen. Hosp., Respirat. Div., Clin. Invest. Unit, Manitoba, Canada). *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 87-91. 22 refs. Med. Res. Council of Canada supported research.

A simple method for measuring the compliance of the total respiratory system utilizing a recording spirometer and lead weights is described. The method was reproducible and compared well with an established body box technique. The compliance of the total respiratory system was determined in 70 normal male subjects between the ages of 4 and 70. The total respiratory compliance was influenced by age and appeared to rise during the first 3 decades and fall in subsequent decades. The compliance was also related to the height, body surface area, total lung capacity, and vital capacity, the best correlation being with vital capacity. The change in compliance with age did not appear to be related to change in body size. When corrected for the total capacity of the lungs, there was a gradual decrease in total compliance with aging. It is suggested that this is due to an increase in resistance of the "chest wall."

A65-80309

LUNG DIFFUSING CAPACITY: CYCLICALLY AND CONTINUOUSLY VENTILATED CLOSED SYSTEMS.

P. Solvsteen (Blegdamshospitalet, Central Lab., and Med. Dept., Dept. of Epidemiol., Copenhagen, Denmark). *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 92-98. 8 refs. Danish State Res. Found. and Christian the Tenth's Found. supported research.

In previous communications, distribution of ventilation and lung diffusing capacity (D_L) were calculated from changes occurring in N_2 and CO concentrations when a subject, whose lungs contained atmospheric air at the beginning of the experiment, respired in a spirometer containing oxygen and a little CO. In the calculations, the system was assumed to be continuously ventilated and without dead space. The present study examines which errors may arise from these simplifications. Equations for cyclic ventilation are derived. Definite values for dead space and for volumes, alveolar ventilation, and D_L of two nonuniformly ventilated lung regions are obtained. Thereupon it is computed how the concentrations of N_2 and CO will change, if a subject

with the assumed values respire in a spirometer of a given volume. From these changes in concentration, D_L and the distribution of ventilation are calculated using equations for continuous ventilation. The differences between the assumed and the calculated values of D_L are small.

A65-80310

LUNG DIFFUSING CAPACITY: REBREATHING METHOD, APPLICABILITY IN NONUNIFORM VENTILATION.

P. Solvsteen (Blegdamshospitalet, Central Lab., and Med. Dept., Dept. of Epidemiol., Copenhagen, Denmark). *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 99-102. 7 refs. Danish State Res. Found. and Christian the Tenth's Found. supported research.

Carbon monoxide concentration changes were calculated when subjects with different distributions of ventilation and lung diffusing capacity (D_L) respire in a small bag. The curve (\log_e CO concentration in the bag) versus (time) will sooner or later appear as a straight line. The D_L is calculated from the slope of the rectilinear section of the curve and from lung and bag volume. If the curve becomes rectilinear within the period considered, D_L is calculated too low. In some cases the curve will not be rectilinear until more than 45 sec have passed, but will appear to be rectilinear during the period from 30 to 45 sec. If such an experiment is discontinued when 45 sec (the usual duration of experiment) have passed, D_L can be calculated at too high, at correct, or at too low values.

A65-80311

FACTORS INFLUENCING THE CONCENTRATION OF EXPIRED NITROGEN AFTER A BREATH OF OXYGEN.

R. J. Mills and P. Harris (Queen Elizabeth Hosp., Dept. of Med., Birmingham, Great Britain). *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 103-109. 16 refs. Endowment Res. Fund of the United Birmingham Hosp. supported research.

In normal subjects, the change in the concentration of nitrogen in expired alveolar air after a single breath of oxygen has been found to be affected by the presence of a pause at the end of inspiration, by varying rates of expiration, and by variations in the initial volume of air in the lungs. The effects of these different respiratory maneuvers are analyzed in terms of the overall dilution of the inspired oxygen, of the unequal and asynchronous movements of the chest wall, and of the presence of a distribution of ventilatory time constants. The evidence suggests that there is a greater uniformity of ventilatory time constants at a middle lung volume than at a high or low lung volume.

A65-80312

FLOW RATE OF ERYTHROCYTES IN THE CAPILLARIES OF THE LUNG.

Dieter Schlosser, Ernst Heyse, and Heinz Bartels (Tubingen U., Physiol. Inst., Abt. für Angew. Physiol.; and Inst. für den Wiss. Film, Böttingen, West Germany).

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 110-112. 9 refs. Deutsche Forschungsgemeinschaft supported research.

The rate of blood flow in the capillaries of the rabbit lung was investigated by cinematographic methods and found to be 0.75 mm/sec during artificial respiration with air applied with a Starling pump during the filming. Using our measured value for the average capillary length of 68 μ , the average contact time for the erythrocytes is 0.1 sec. If it is assumed that the capillaries to have a length of 100 μ , the contact time would amount to 0.15 \pm 0.05 sec. The discrepancy with the saturation time obtained from in vitro experiments is discussed. It is shown that insufflation increases the capillary blood flow in the lungs.

A65-80313

PULMONARY DIFFUSING CAPACITY AND CAPILLARY BLOOD VOLUME IN NORMAL AND ANEMIC DOGS.

Denise Jouasset-Strieder, John M. Cahill, John J. Byrne, and Edward A. Gaensler (Boston City Hosp., Third Surg. Res. Lab.; and Boston U. Med. Center, Mass. Mem. Hosp., Thoracic Serv., Mass.) *Journal of Applied Physiology*, vol. 20, Jan. 1965, p. 113-116. 19 refs. Contract DA-49-193-MD-2206; and Natl. Heart Inst. Grants HE-05933; HTS-5562; and 1-K6-He1173-01.

The CO diffusing capacity (D_L) was measured by the single-breath method in eight anesthetized dogs. Pulmonary capillary blood volume (Vc) and membrane diffusing capacity (DM) were determined in six animals by the method of Roughton and Forster. The studies were repeated after anemia had been induced by replacing whole blood with plasma. Large dogs were selected with a mean body weight of 29 kg and a mean alveolar volume of 2020 ml (STPD) during tests. The mean arterial blood Hb decreased from 14.3 to 6.6 g/100 ml, the mean D_L from 27 to 12 ml/min mm Hg, and the mean DM from 100 to 47 ml/min mm Hg. The Vc averaged 67 ml in the control state and was not significantly changed during anemia. Reductions in D_L and DM during anemia were proportional to the fall in blood Hb. Both D_L and DM in all dogs, normal and anemic, were proportional to the volume of red blood cells in the lung capillaries (VRBC). These results suggest that VRBC might be an estimate of the useful area of the alveolar-capillary membrane while DM/VRBC should vary with changes in its thickness. The latter was not altered by anemia.

A65-80314

SWEAT SUPPRESSION BY FORCED BREATHING IN MAN.

Roy E. Albert (Army Res. Lab., Fort Knox, Ky.)

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 134-136.

Thermal sweating from the forehead was suppressed by forced air breathing in two normal male subjects. The decreased sweat rate was associated with symptoms of respiratory alkalosis. This sweat suppression was blocked by the introduction of excess carbon dioxide into the respired gas.

A65-80315

INITIAL RESPONSES TO ADDED VISCOUS RESISTANCE TO INSPIRATION IN DOGS.

Ronald L. Wiley and Fred W. Zechman, Jr. (Ky. U., Coll. of Med., Dept. of Physiol. and Biophys., Lexington).

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 160-163. 5 refs.

Contract AF 33(657)-9331.

Respiratory mechanics and diaphragm electromyograms in six anesthetized dogs were studied to determine the immediate nonchemical responses to three levels of added airflow resistance to inspiration. Inspiratory time, intrathoracic pressure amplitude diaphragm activity, and inspiratory work all increased in the first breath with added resistance. The adjustments to added viscous resistance are interpreted as indicating an immediate active response, which tends to maintain an adequate tidal volume. Even though tidal volume decreased with added resistance, the area under the inspiratory volume curve was unaltered on the first resistance breath. Thus, during the initial response, inspiratory duration may depend primarily upon the accumulated or summated information related to change in volume. Work done on the lung and apparatus was greater with added resistance. The increase resulted from the increased inspiratory time rather than change in rate at which work developed during the inspiration. After two to three breaths on resistance, the inspiratory work rate began to increase, probably reflecting the addition of secondary chemical drive.

A65-80316

LUNG VOLUME AND VENTILATORY RESPONSE TO AIRWAY OBSTRUCTION DURING TREADMILL EXERCISE.

Burton S. Tabakin and John S. Hanson (Vt. U., Coll. of Med., Mary Fletcher Hosp., Dept. of Med., Cardiopulmonary Lab., Burlington).

Journal of Applied Physiology, vol. 20, Jan. 1965, p. 168-170. 7 refs.

Natl. Heart Inst. Grant H-4010 (C3-05).

Measurement of lung volumes and certain ventilatory variables during treadmill exercise with a 5-mm expiratory airway obstruction revealed significant changes in residual volume, expiratory reserve volume, and lung clearance index as compared to values obtained without obstruction. These variations in themselves do not explain previously observed large decrements in oxygen utilization with acute airway obstruction. However, the additive effects of decreased alveolar ventilation and alterations in intrapulmonary gas distribution could account for this phenomenon.

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